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第八卷

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ANNOTATIONES

ZOOLOGICÆ JAPONENSES

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Notes on the Japanese
Fauna

Vol. VIII

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(Published July 8th, 1912).

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Eine neue *Ozobranchus*-Art aus China.

(*Oz. jantseanus* n. sp.)

Von

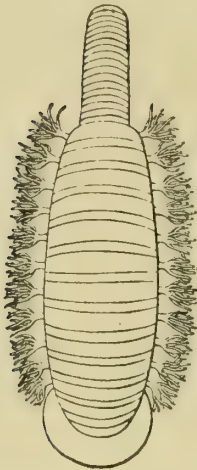
Dr. Asajiro Oka, Tokio.

Unter dem Hirudineen-Material, das ich vor einiger Zeit aus China erhalten habe, befindet sich ein kleiner, der Gattung *Ozobranchus* zugehöriger Fischegel, welcher bei Wutschang an einer Flussschildkröte schmarotzend gefunden wurde. Derselbe stellt eine neue, bisher unbeschriebene Spezies dar und ist deswegen besonders interessant, dass er durch die Zahl und Lage der Kiemenanhänge gewisse Ähnlichkeit mit dem Genus *Branchellion* aufweist. Auch der Umstand, dass er im Süsswasser erbeutet wurde, ist beachtenswert, da die Gattung *Ozobranchus* sonst auf das Meer beschränkt ist.

Das einzige mir vorliegende Exemplar ist 9 mm lang und an der breitesten Stelle des Rumpfes 2 mm breit, die seitlichen Kiemenanhänge nicht einbegriffen. Wie schon ein Blick auf die nebenstehende Figur zur Genüge zeigt, stimmt die neue Art in äusserer Gestalt mit den japanischen Stücken von *Oz. branchiatus*, die ich in einer früheren Arbeit¹⁾ beschrieben habe, ziemlich genau überein, bis auf die Kiemenanhänge, welche die Unterscheidungsmerkmale abgeben. Unser Tierchen ist nämlich mit 11 Paar solcher Gebilde ausgestattet, während die Vergleichsart deren nur 7 Paar besitzt. Auch die Grössenverhältnisse der Kiemen sind bei beiden Formen nicht die gleichen. Im Gegensatz zu *Oz. branchiatus*, bei welchem die Branchien nach hinten zu allmählich an Grösse abnehmen, sind diese bei der neuen

1) A. Oka, Description d'une espèce d' *Ozobranchus*, Zoological Magazine, Vol. VII, No. 75. 1895.

Form alle gleichmässig entwickelt und bilden zusammen einen echten Fransensaum an beiden Seiten des Körpers.



Ozobrancheus jantseanus.
Vergr. 8/1.

Am vordern, den Kopf und Hals umfassenden Körperteil zählt man 18 Ringe, wovon die 3 ersten auf der Bauchseite den Mundsaugnapf bilden. Die übrigen Ringe sind unter sich ziemlich gleich. Die Augen, in 1 Paar vorhanden, haben ihre Lage am vordern Rand des zweiten Ringes seitlich der Medianlinie. Eine scharfe Grenze zwischen dem Kopf und dem Hals lässt sich äusserlich nicht erkennen. An der Basis des Halses, wo er in den Rumpf übergeht, befinden sich auf der Ventralseite die Geschlechtsöffnungen, die männliche und die weibliche um einen kleinen Bruchteil einer Ringbreite von einander entfernt.

Der Rumpf setzt sich aus 27 Ringen zusammen. Diese sind aber nicht gleich gross, sondern treten hauptsächlich in zwei verschiedenen Grössen auf und zwar in der Weise angeordnet, dass breitere und schmalere Ringe meistens abwechseln. Man beobachtet nämlich 11 breite und 11 schmale Ringe, die regelmässig alternieren, dann folgen 5 andre, die nach dem hintern Saugnapf zu immer an Grössen abnehmen. Von der Bauchseite gesehen, ist jeder der breiteren Ringe mit dem darauf folgenden schmalen Ringe mehr oder weniger vollkommen verschmolzen, so dass hier die Gesamtzahl der Ringe bedeutend kleiner ausfällt als auf der Dorsalseite. Der hintere Saugnapf ist halbkugelförmig und wie gestielt, weil der Körper unmittelbar vor demselben stark verjüngt ist; sein Durchmesser kommt der Rumpfbreite fast gleich.

Die 11 breiten Ringe des Rumpfes tragen an beiden Seitenrändern

je einen Kiemenanhang. Dieser zeigt genau denselben Bau wie die entsprechenden Gebilde von *Oz. branchiatus*; er besteht aus einem Basalstück und zwei, allerdings ganz kurzen Ästen, die sich wiederum in je 4 bis 7 Kiemenfaden zerspalten. Sie sind alle gleichmässig entwickelt, indem die vordersten im Vergleich mit den hintersten kaum an Grösse zurückstehen. Dies fiel mir besonders auf, da bei zahlreichen Exemplaren von *Oz. branchiatus*, die ich neulich in der Sagami-See gesammelt habe, die Kiemenanhänge von vorn nach hinten so merklich an Grösse abnehmen, dass die des letzten (7.) Paares fast als rudimentär zu bezeichnen sind. Die neue Art stellt demgemäss eine Übergangsform zu dem Genus *Branchellion* dar, welches ebenfalls mit gleichmässig ausgebildeten Kiemenanhängen ausgestattet ist. Merkwürdigerweise ist die Zahl der kiementragenden Rumpfsomiten bei beiden Formen die gleiche, indem sie sowohl bei *Branchellion* wie auch bei unserm Tier 11 beträgt. Diese 11 Somiten lassen sich bei allen Ichthyobdelliden auch an einer Reihe anderer anatomischer Merkmale gut charakterisieren und sind meines Erachtens als eine besondere Körperregion aufzufassen. In diesem Zusammenhange möchte ich noch erwähnen, dass bei *Ozobranchus* jeder der breiten Ringe des Rumpfes dem 1. und 2. Ring eines ursprünglich 3-ringeligen Neurosomites entspricht, wie es bereits J. PERCY MOORE²⁾ mit Recht hervorhob, und dass die Kiemenanhänge dem zweiten, das Nervenganglion enthaltenden Ringe des betreffenden Somites zugehören.

Das Exemplar, welches der vorliegenden Mitteilung zugrunde liegt, wurde von meinem Schuler und Freund, Herrn K. Usui in Wutschang, der dort an einer chinesischen Hochschule als Lehrer angestellt war, in der Nähe der genannten Stadt erbeutet. Die Schildkröte (eine *Clemmys*-Art nach Usui's Angabe), an deren Kopf nahe dem Auge unser Wurm befestigt war, wurde auch aufgehoben

2) J. Percy Moore, Note on Oka's biannulate Leech. Zool. Anz. Bd. XXIII. No. 623. 1900.

und befand sich bis vor kurzem in seiner Sammlung, ist aber wegen der inzwischen ausgebrochenen Unruhen nicht mehr zu erhalten.

Mit Auffindung der oben geschilderten Spezies ist die Zahl der bekannten *Ozobranchius*-Arten auf 3 gestiegen. Diese lassen sich folgendermassen unterscheiden:

- a. Rumpf mit 5 Paar Kiemenanhängen (Mittelmeer)
Ozobranchius margoï (Apathy).
- b. Rumpf mit 7 Paar Kiemenanhängen (Pazifik)
Oz. branchiatus (Menzies).
- c. Rumpf mit 11 Paar Kiemenanhängen (Jantsekiang).. .. .
Oz. jantseanus n. sp.

Tokio, den 16. Nov. 1911.

Observations and Experiments on the Ctenophore Egg.

III. Experiments on Germinal Localization of the Egg of *Beroë ovata*.

By

Naohide Yatsu.

CHUN'S isolation experiments on the egg of *Eucharis multicornis* carried on in the summer of 1877 and described fifteen years later ('92 p. 104) had given DRIESCH and MORGAN ('95) an impetus to study more fully the development of isolated blastomeres and egg-fragments of *Beroë ovata*. Their study was followed by FISCHER'S clear analytical investigation on the germinal localization of the same animal ('97, '98 and '03). ZIEGLER ('98) incidentally carried on similar experiments while studying the mode of cleavage of the *Beroë* egg after operation. These works, it seemed to me, were so satisfactorily carried out that we do not need any further experiment along this line of study. Yet when I repeated at Naples the investigations of the above authors in somewhat extensive ways, some new data were obtained, which embody the present paper.

Of many eggs operated upon in forty different ways 216 reached two-day embryos,¹ at which time they were examined and sketched. The numbers of comb-plates were recorded in each case for the purpose of future comparison. Instead of giving the results of individual series of experiments I shall only describe those which will serve as a supplement to FISCHER'S thoroughgoing investigations.

¹ Incidentally it may be of interest to note that in two-day embryos there is no co-ordination in the movement of comb-plates, each performing its flickering motion of its own rhythm.

1. *Removal experiments performed prior to the formation of the polocytes.*

A portion of cytoplasm was cut off before the polocytes were formed ; most eggs were operated before fertilization : some may have been cut after it. It was extremely difficult to determine the exact moment of fertilization. Moreover at this time there is no landmark to orient section planes ; the record was necessarily incomplete.

Of thirteen cases eleven had eight rows of comb-plates, while two had seven rows (Fig. 1). In two cases the number of comb-plates was smaller than in the normal embryos. In one case one of the entodermal pockets was short ; in another two of them were short (Fig. 2). Excepting these defective cases all the rest were normal. Judging from the size of resulting embryos a considerable amount of cytoplasm must have been cut off in some cases, yet those produced from such pieces were quite normal. This taken with the fact that sectioning were performed at random, it may not be amiss to infer that the germinal stuffs for the future comb-plates and for the entodermal pockets have not yet been well localized.

For the sake of comparison some eggs were cut in two between the formation of the polocytes and the beginning of the first cleavage. Of ten eggs thus operated upon three were perfect, all the others being more or less defective, as FISCHEL has found out ('03).

The above two series of experiments will show that there is a decided advance in the specification of germ-regions after the formation of the polocytes.

DRIESCH and MORGAN ('95 pp. 217-219) describe sixteen embryos resulting from the removal of a certain amount of cytoplasm from the egg from three to four hours prior to the first cleavage. But since the exact time of operation in relation to both fertilization and polocyte formation has not been recorded, their results cannot directly be utilized for the question under consideration.

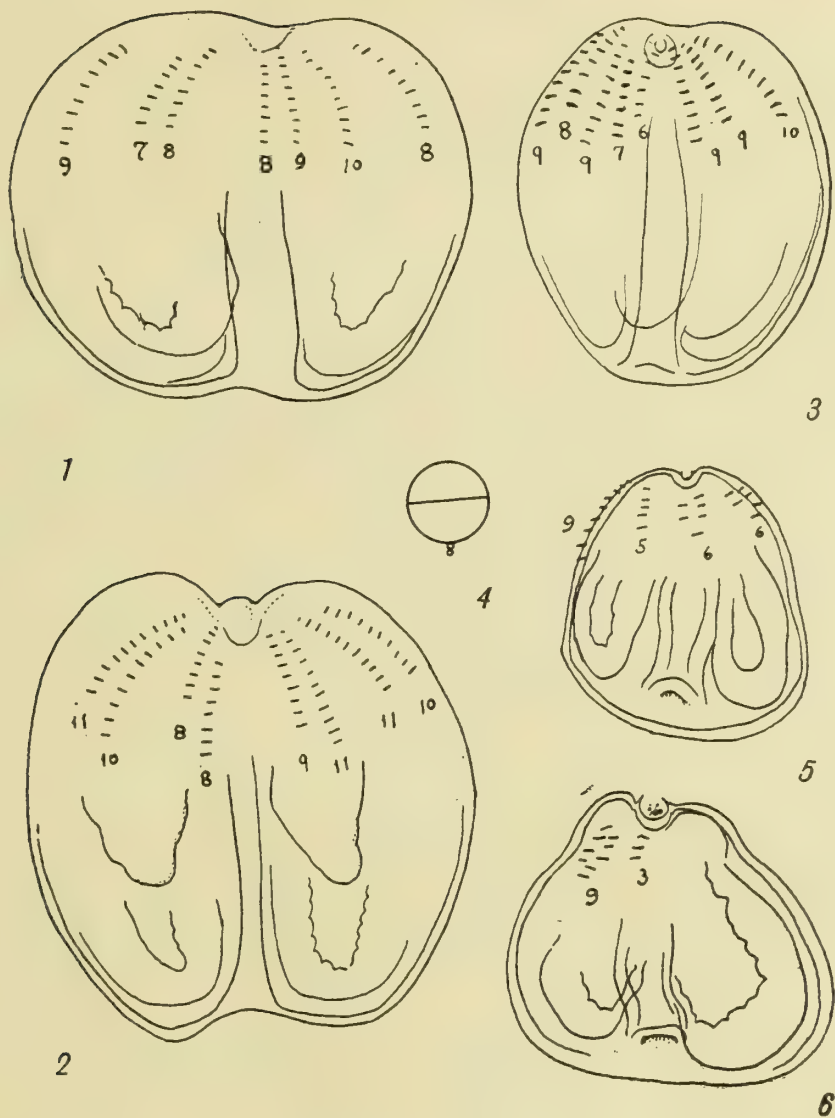
Figs. 1-6 $\times 60$.

Fig. 1, embryo with seven comb-rows developed from an egg operated before the formation of the polocytes; Fig. 2, embryo with eight comb-rows and two shorter entoderm sacs resulted from the same operation as Fig. 1; Fig. 3, normal small sized embryo from the same operation; Figs. 5 and 6, twin embryos developed from an egg operated as in Fig. 4.

2. *Twin embryos.*

It is interesting to note that from an egg which was cut in two along the equatorial plane before the beginning of the first cleavage developed two embryos (Figs. 4, 5 and 6). Unfortunately I did not record which fragment had the polocytes, two being reared in one salt-cellar. But judging from the number of comb-rows, it is almost certain that the embryo represented in Fig. 5 is from the micro-merie half.

The egg must have been fertilized more than one spermatozoon, one of the embryos being merogonic. At any rate the points of interest regarding these twin embryos lie in the fact that both of them had a well developed apical sense organ, stomodaeum and two entoderm sacs. From this it may be concluded that the basis of the sense organ is not restricted to one hemisphere.

3. *Formation of comb-rows in the end cells and middle-cell.*

To determine whether the end-cells and middle-cells behave in the same way in respect to the capacity of forming of comb-rows, the following series of experiments were made.

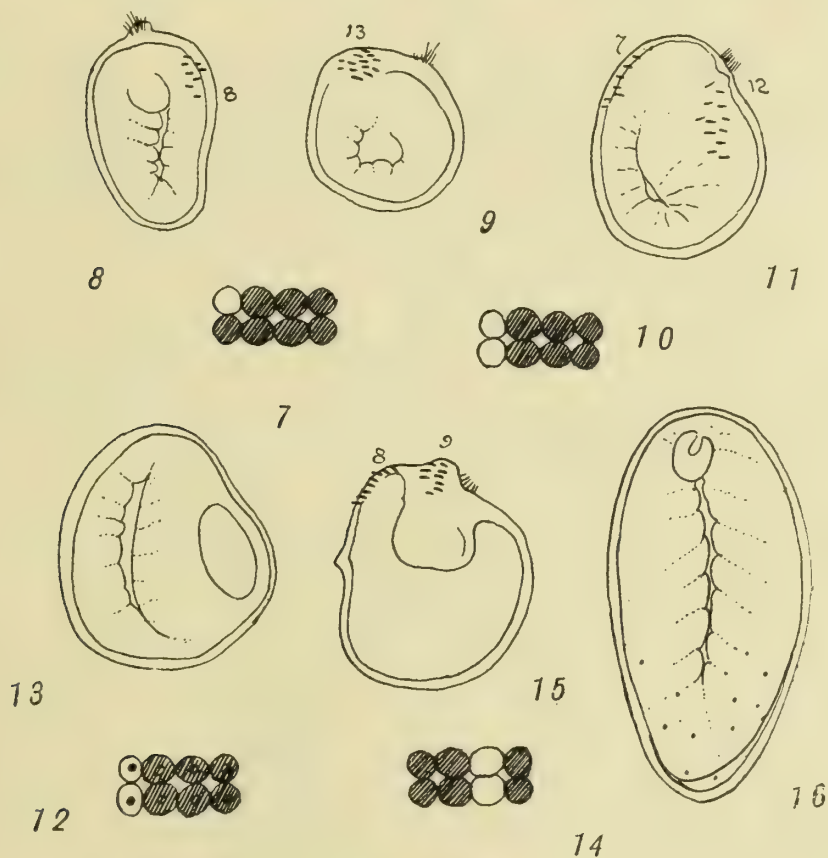
At the 8-cell stage one end-cell was separated (Fig. 7) from other blastomeres and was allowed to develop. Twelve embryos were obtained. All of them had one row of comb-plates and no stomodaeum (Figs. 8, 9).

From two end-cells (Fig. 10) I had embryos with two rows of comb-plates and without the stomodaeum (Fig. 11) (six cases).

Two middle-cells were cut out at the 8-cell stage (Fig. 14). The resulting embryos (five cases) showed a great deal of variations. In one of them two comb-rows were formed (Fig. 15) as we might anticipate. In another embryo a very small group of comb-plates was developed. In three no comb-rows were formed at all. One of

them is represented in Fig. 16. This strikingly resembles embryos developed from two end-cells of the 16-cell stage deprived of the first micromeres (Figs. 12, 13).

In comparing the above results it may be concluded that in the middle-cell the development of comb-plates is arrested in some cases. The difference in behavior between the end- and middle-cells can hardly be due to that of the degree of injury, if any, received at the



Figs. 7—16. $\times 60$.

Figs. 8 and 9, embryos from E (Fig. 7); Fig. 11, embryos from 2E (Fig. 10); Fig. 13, embryo from 2E—2e₁ (Fig. 12); Fig. 15, embryo with two comb-rows developed from 2M (Fig. 14); Fig. 16 combless embryo from 2M.

operation, but rather to that of the initial organization or some other physiological conditions. It may be interesting to add that the stomodaeum fails to develop in all the cases of the above isolation experiment, namely E, 2E and 2M.¹ The sense organ may be formed (Figs. 8, 9, 11, 15).

4. *Variation in the formation of the comb-rows.*

It cannot be doubted that each blastomere of the 8-cell stage contains the basis for one comb-row in it as has been ascertained by FISCHEL ('97 p. 122). I tried several series of experiments and the results agree in almost all cases with his, but exceptionally I met with the cases in which the number of comb-rows was greater or less than that of the original blastomeres.

The embryos developed from two middle-cells have just been described in the last section. 1E+2M gave rise to larvae with two comb-rows (six cases) (Figs. 19, 21). Fig. 20 is an embryo with three comb-rows from such combination of blastomeres. 2E+1M yielded larvae with two comb-rows (one case) (Figs. 17, 18) and four rows (four cases). 3E+2M should give rise five-rowed larvae, but I have three cases with six rows (Figs. 24, 25). From 2E+3M resulted four-rowed embryo (one case) (Fig. 22, 23).

In the above exceptional cases one at once notices that the number of the resulting comb-rows is usually smaller than that of the blastomeres. This may well be explained as the arrested development, but how the resulting embryo has more comb-rows than it might be expected from the number of the original blastomeres is very difficult to interpret. The latter cases may be due to unequal distribution of the ctenoplasm among the blastomeres.

¹ E=end-cell, M=middle-cell.

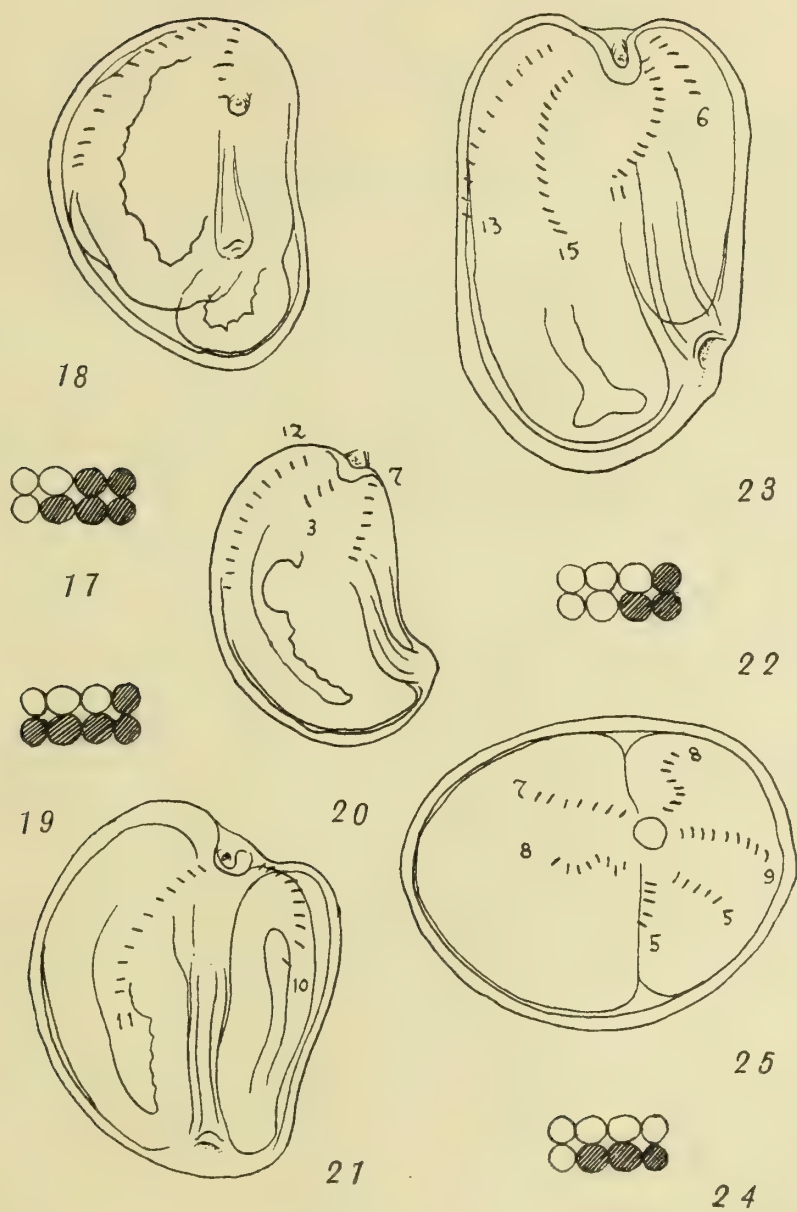
Figs. 17-25. $\times 60$.

Fig. 18, embryo from 2E+1M (Fig. 17); Figs. 20, 21 embryos from 2E+2M; Fig. 23 embryo from 2E+3M (Fig. 22); Fig. 25 embryo from 3E+2M (Fig. 34).

5. *Development of the first quartet cell in isolated fragments.*

FISCHEL'S conclusion that the entire ctenoplasm is located in the first quartet cells ('97 p. 122), was tested in various ways and that was found to hold in almost all cases, *e. g.*, $2E + e_1 + M + m_1$ ¹ produced an embryo with two comb-rows and $3M + 3m + e$, that with four rows. In some cases, however, the first quartet cells deprived of the asabl blastomeres seem to fail to develop comb-plates altogether as is seen from the following experiments :

$2E + 2M + 4e_1 + 4m_1$ should produce eight-rowed embryo but this gave rise to an embryo with six rows of comb-plates. $5E + 2M + 4e_1 + 4m_1$ also yielded an embryo with six rows ; $4E + 4e_1 + 4m_1$, six rowed embryo.

6. *Summary.*

1. Germinal localization becomes more definite after the formation of the polocytes.

2. Each of twin embryos produced from an egg by an equatorial section before the first cleavage may possess the apical sense organ.

3. Since some of the blastomeres of the 8-cell stage or, more precisely speaking, those of the first quartet fail in some cases to develop comb-rows, the importance of correlative differentiation should not be overlooked in the development of the ctenophore egg.

4. Very rarely the distribution of the ctenoplasm among the blastomeres of the 8-cell stage may vary so that the number of comb-rows in resulting embryos exceeds that of the initial blastomeres.

Zoological Institute, Tokyo Imp. Univ.

October 28, 1911.

¹ Here E and M indicate the basal cells after the first quartet being given off.

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-

Die Cicadinen Japans

II. *

Von

Prof. S. Matsumura.

Fam. Membracidae.

Gen. **Leptocentrus** Stål.

Stål, Hem. Afr. IV, p. 90 (1866).

1. *Leptocentrus formosanus* n. sp.

Schwarz, matt, graulich zart behaart. Antennen und Rostrum gelblich. Scheitel und Pronotum dicht grob punktirt. Die seitlichen Fortsätze dornartig, scharf zugespitzt, schief nach aussen gerichtet und nach hinten gebogen, an den Kanten gekielt, oben und unten mit einem von der Basis bis zur Spitze laufenden Kiel, welcher näher der hinteren als an der vorderen Kante liegt. Der hintere Fortsatz schmal, dornartig, scharf zugespitzt, länger als der Hinterleib, an der Basis bogenartig gekrümmt, vom Scutellum weit entfernt. Scutellum ist in der Mitte und an den Rändern gekielt, der Mittelkiel nach dem Vorderrand des Pronotums verlängert. Schildchen lang, dreieckig, gelblichgrau behaart, grob punktirt, an der Spitze schmal dreieckig. Elytren lang, subhyalin, gelblich, am Vorderrande bräunlich, quer gerunzelt, an der Basis rauchbraun; Nerven deutlich dicht gekörnelt. Flügel gelblich, hyalin, mit hellbräunlichen Nerven. Brust und Bauch weisslich tomentirt, Dorsum spärlich tief

* Fortsetzung von Ann. Zool. Jap. Vol. VI, Part 2, 1907, p. 83—116.

punktirt. Beine schwärzlichbraun, glänzend; Schenkel an der Spitze sowie die Tibien und Tarsen mit Ausnahme ihrer Spitzen gelblich.

Länge: ♀ $8\frac{1}{2}$ mm.

Hab.—Formosa (Kanshirei); gesammelt in einem ♀ Exemplare vom Verfasser.

Der form nach *L. taurus* F. sehr ähnlich, die seitlichen Fortsätze des Pronotums jedoch nach hinten stärker gekrümmt und an der Spitze allmähig scharf zugespitzt; der hintere Fortsatz schmaler und länger und noch stärker bogenartig gekrümmt.

T. N.: Bekko-tsunoze-mi.

Gen. **Platybelus** Stål.

Stål, Hem. Afr. IV, p. 91 (1866).

1. *Platybelus pilosus* Wk.

Centrotus rectangulatus Kby., Journ. Linn. Soc. Zool. XXIV, p. 166 (1891).

Hab.—Formosa, Tonkin, Annam, Indien.

T. N.: Kenaga-tsunoze-mi.

Gen. **Centrotus** F.

Fabricius, Syst. Ryhn., p. 16 (1803).

1. *Centrotus flavipes* Uhl.

Orthobelus flavipes Uhl, Proc. U. S. N. Mus. 19, p. 284 (1896).

Hab.—Hokkaido, Honshu; häufig auf *Alnus*- und *Ulmus*-Pflanzen.

T. N.: Tsunoze-mi.

2. *Centrotus sibiricus* Leth.

Gargara sibirica Leth., Ann. Soc. Ent. Belg. 19, p. LXXX (1876).

Machaerotypus sellatus Uhl., Proc. U. S. N. Mus. 19, p. 284 (1896).

Hab.—Hokkaido, Honshu; häufig auf verschiedenen Laubholzpflanzen wie *Alnus*, *Ulms*, *Salix*, etc.

3. *Centrotus nitobei* n. sp.

Purpurbraun, Scheitel schwärzlichbraun, Rostrum gelblich. Scheitel dicht fein, Pronotum aber grob und tief punktirt; die beiden gelblich anliegend behaart. Die seitlichen Fortsätze schief nach oben und hinten gerichtet, scharf an der Spitze, am Vorderrande mit einem Kiel und säbelartig scharf-kantig, am hinteren Rande mit zwei Kielen. Der hintere Fortsatz schmal, an der Basis deutlich schmaler als das Scutellum, prismatisch, die Spitze des Abdomens nicht erreichend, an der Spitze scharf zugespitzt. Scutellum an den Seiten weiss tomentirt. Elytren subhyalin, gelblich getrübt, die Basis castanienbraun; Nerven braun, nur diejenigen auf der Grenze der Basis sowie auch diejenigen auf der Spitze gelblich. Flügel hyalin, Nerven bräunlich. Brust gelblich-weiss, Bauch weisslich anliegend behaart. Beine castanienbraun, weisslichgrau behaart. Dorsum spärlich tief punktirt.

Länge: ♀ 10 mm.

Hab.—Aomori (Sambogi); gesammelt in einem ♀ Exemplare von Herrn I. Nitobe.

Der Form nach *O. flavipes* Uhl. etwas ähnlich, aber viel grösser und die seitlichen Fortsätze des Pronotums viel länger.

T. N.: Nitobe-tsunozemi.

4. *Centrotus mojiensis* n. sp.

Castanienbraun, Scheitel schwärzlichbraun, Rostrum und Beine vorwiegend gelblichbraun. Scheitel und Pronotum fein punktirt, gelblich dicht anliegend behaart. Die seitlichen Fortsätze des Pronotums schief nach aussen und vorwärts gerichtet, an der Spitze abgestutzt, vorn und hinten ziemlich scharf gekielt, unten niedrig gekielt. Der hintere Fortsatz prismatisch, die Basis des Scutellums nicht ganz bedeckend, über die Mitte des Abdomens erreichend, der

Rückenkiel ziemlich hoch, an der Spitze scharf zugespitzt, mit etwa 12 grossen tiefen Punkten versehen. Scutellum an den Seiten weisslich tomentirt. Elytren stark runzelig, subhyalin, blassgelblich getrübt, an der Basis verbräunt, punktirt, gelblich nervirt, hie und da mit etwa 17 braunen Körnchen. Flügel hyalin. Wangen, Clypeus und Vorderbrust weisslich tomentirt. Bauch anliegend gelblich behaart. Coxen und Femur mit Ausnahme der Spitze dunkelbraun.

Länge: ♀ 7 mm.

Hab.—Hokkaido (Otaru), Honshu (Morioka, Hakone, Moji); gesammelt in 4 ♀ Exemplaren von Herren M. Ishida, J. Omori und dem Verfasser.

Der Form der seitlichen Fortsätze nach, der Gattung *Oxyrhachis* etwas ähnlich.

T. N.: Moji-tsunozeimi.

5. *Centrotus dorsalis* n. sp.

Castanienbraun, anliegend graugelblich behaart. Scheitel und Pronotum dicht fein punktirt. Die seitlichen Fortsätze des Pronotums schief nach aussen und hinten gebogen, an der Spitze gegabelt; die hintere Gabel deutlich niedriger als die vordere; an der Basis innen-seits grubig ausgehöhlt; vorn, hinten und unten gekielt. Der hintere Fortsatz gross, comprimirt, fast halbkreisförmig, auf der Scheibe gelblich punktirt, am Ende zugespitzt. Elytren dunkelbraun, in der Mitte subhyalin, am äusseren Rande mit Membran hyalin in der Mitte; Apicalzellen, die erste ausgenommen, je mit einem hyalinen Flecke; am Hinterwinkel auch eine hyaliner Fleck. Flügel hyalin, mit braunen Nerven. Rostrum und Beine gelblichbraun; Coxen und Schenkel, die Spitze ausgenommen, dunkelbraun; die Tibien unten etwas dunkler. Brust und Bauch anliegend, graulich und kurz behaart.

Länge: ♀ 6 mm.; Entfernung zwischen den Hornspitzen 3 mm.

Hab.—Formosa; gesammelt in einem ♀ Exemplare von Herrn I. Nitobe zu Kammutsu bei Horisha.

Der Form nach *C. sibiricus* Leth. etwas ähnlich. Den Hörner nach *Platybelus pilosus* Wk. etwas ähnlich.

T. N.: Sedaka-tsunozemi.

6. *Centrotus kuyanianus* n. sp.

Castanienbraun; dicht, lang, anliegend und golden behaart. Die seitlichen Fortsätze des Pronotums schief nach aussen und hinten gerichtet, an der Spitze zugespitzt; vorn, hinten und unten gekielt. Der hintere Fortsatz prismatisch, scharf zugespitzt, an der Spitze grob punktirt, über die Mitte des Abdomens erreichend. Elytren gelblich subhyalin, an der Basis bräunlich, die sämtlichen Nerven sehr fein und gelblich behaart. Flügel hyalin, gelblich nervirt, Costa in der Mitte mit einem hellbräunlichen Fleckchen. Brust an den Seiten weisslich tomentirt. Beine rötlichbraun; Coxen und Schenkel, die Spitze ausgenommen, pechschwarz; Tarsen etwas heller. Abdomen spärlich tief-punktirt, schwärzlichgrau; Bauch pechschwarz, gelblich behaart.

Länge: ♀ 6 mm.; Entfernung zwischen den Hornspitzen 4 mm.

Hab.—Formosa (Tappan); gesammelt in einem ♀ Exemplare vom Verfasser.

Der Form nach *C. basalis* Wk. etwas ähnlich, die seitlichen Fortsätze des Pronotums aber viel länger und stärker.

T. N.: Kuyania-tsunozemi.

7. *Centrotus basalis* Wk.

Centrotus basalis Wk., List. Hom. B. M. II, p. 626 (1851).

Hab.—Formosa (Shoka, Horisha, Ako, Koshun); China, Singapur, Colombo, Java.

T. N.: Taiwan-tsunozemi.

8. *Centrotus koshunensis* n. sp.

Castanienbraun, Kopf und der Vorderrand des Pronotums oft schwärzlich. Scheitel und Pronotum fein punktirt, kurz golden be-

haart. Die seitlichen Fortsätze des Pronotums kurz, nach aussen und hinten gerichtet, an der Spitze stumpf zugespitzt und daselbst etwas dunkler gefärbt. Der hintere Fortsatz des Pronotums über die Mitte des Abdomens erreichend, schmal, prismatisch, an der Spitze etwas dunkler, an der Basis das Scutellum nicht ganz bedeckend. Elytren subhyalin, gelblich getrübt, an der Basis bräunlich, punktirt; in der Mitte mehr oder weniger ausgedehnt bräunlich gefleckt, mindestens die Mittelquernerven bräunlich gefärbt; die Nerven vorwiegend gelblich, bei einigen Exemplaren aber die Apicalnerven etwas verbräunt; die Membran oft an der Spitze und nahe dem Hinterwinkel verbräunt. Hinterflügel weisslich, subhyalin, weisslich nervirt. Beine gelblich-braun; Coxen und Schenkel, die Spitze ausgenommen, pechschwarz; die Tarsen heller. Brust an den Seiten weiss tomentirt. Abdomen spärlich tief-punktirt, graubraun.

Länge: ♂ ♀ 4—4.5 mm.; Entfernung der Hornspitzen 3 mm.

Hab.—Formosa (Shinsha, Koshun); gesammelt in zahlreichen Exemplaren vom Verfasser.

Der form nach *C. basalis* Wk. etwas ähnlich, aber viel kleiner.

T. N.: Mon-tsunozei.

9. *Centrotus akonis* n. sp.

♀ hellbräunlich, ♂ schwärzlichbraun. Scheitel und Pronotum grob punktirt; kurz und anliegend golden behaart. Die seitlichen Fortsätze des Pronotums in verschiedener Ausbildung: meistens sehr kurz, bei einigen Exemplaren, besonders beim ♂, fehlen sie ganz*; vorn, hinten und unten gekielt. Der hintere Fortsatz prismatisch, die Mitte des Abdomens erreichend, in der Mitte (besonders beim ♂) etwas

* Die Exemplaren, an welchen die seitlichen Fortsätze fehlen, gehören zweifellos an der Gattung *Gargara* Amyot, während die Hörner besitzenden Exemplaren der Gattung *Centrotus* (*Tricentrus* Stål) F. zugetheilt werden müssen. So will ich hier, wie es schon von Walker geschehen ist, die erstere Gattung an die letztere vereinigen, bis eine gründliche Revision der Gattungen der indomalayischen Membraciden fertig sein wird.

erhoben und an der Basis etwas schmaler; an der Spitze beim ♀ verdunkelt. Elytren subhyalin, gelblich getrübt, an der Basis bräunlich, punktirt; die Nerven blassgelblich, die in der Mitte liegenden etwas verbräunt; die Membran vorwiegend bräunlich, an der Spitze des Clavus verhellet. Flügel weisslich subhyalin, die Nerven blassgelblich. Beine gelblichbraun; Coxen und Femur, die Spitze ausgenommen dunkelbraun; Hinterbrust an den Seiten je mit einem weisslich tomentierten Flecke. Abdomen spärlich tief-punktirt; Bauch glänzend, fein punktirt, blassgelblich anliegend behaart.

Länge: ♂ ♀ 3—4 mm.

Hab.—Formosa (Koshun, Ako, Shinsha, Shirin, Hokuto).

T. N.: Hime-Taiwan-tsunozei.

10. *Centrotus (Gargara) variegatus* n. sp.

Langoval; Scheitel und der vordere und hintere Teile des Pronotums schwärzlichbraun. Pronotum vorwiegend hellbräunlich, Scheitel und Pronotum dicht tief-punktirt und ziemlich dicht weissgrau behaart. Pronotum ohne seitliche Fotsätze; der hintere Fortsatz kurz, die Mitte des 3ten Abdominalsegments nicht ganz erreichend, an der Spitze plötzlich verschmälert. Elytren weisslich, subhyalin; die Basis, die Spitzenhälfte des Clavus, eine breite bogenartige Querbinde im Apicaldritteln, ein Fleck an der Spitze und die Nerven des Mittel- und Apicalfeldes vorwiegend schwärzlichbraun. Die Nerven ziemlich lang behaart. Brust und Bauch schwärzlichbraun; Bauchsegmente an der Basis blassgelblich, nur an den Seiten punktirt. Beine schwärzlichbraun, weisslichgrau lang behaart; Schenkel an der Spitze, die Tibien und die Tarsen an der Basis hellbräunlich.

Länge: ♀ 4.5 mm.

Hab.—Formosa (Arisan); gesammelt in einem ♀ Exemplare vom Verfasser.

11. *Centrotus (Gargara) ligustri* n. sp.

♀ Oval, castanienbraun; kurz golden-behaart; Schenkel und der Vorderteil des Pronotums schwärzlichbraun; Clypeus und Wangen

dicht weiss-tomentirt. Pronotum ohne seitliche Fortsätze; der hintere Fortsatz prismatisch und allmählig schmal zugespitzt, bei dem Scutellum ein wenig gebogen, die Clavalspitze erreichend. Scutellum an den Seiten weissgrau behaart. Elytren weisslich subhyalin; die Nerven gelblich, sehr kurz gelblich behaart; die Basis, zwei breite Querbinden in der Mitte und der Apicaldrittel castanienbraun, die Apicalnerven verbräunt; Bauch und Brust schwärzlichbraun, dicht punktirt, weisslich behaart; Brust an den Seiten weiss tomentirt. Beine gelblichbraun; Schenkel oben und Coxen an der Basis schwärzlichbraun, silberweiss behaart. Scheidenpolster am Innenrande und Legescheide castanienbraun.

Länge: ♀ 6 mm.

Hab.—Honshu (Tokyo, Takasago); gesammelt in 4 ♀ Exemplare auf einer *Ligustrum*-Art.

12. *Centrotus (Gargara) gargampinus* n. sp.

Breitoval. Castanienbraun, kurz, gelblichgrau behaart. Scheitel und Pronotum grob punktirt. Die seitlichen Fortsätze sehr niedrig, bei einem Exemplare waren sie undeutlich, bei einem anderen ziemlich hoch, vorn und hinten deutlich gekielt, nach hinten und aussen gerichtet. Der hintere Fortsatz kurz, die Spitze des Clavus bei weitem nicht erreichend, prismatisch, an der Spitze allmählig scharf zugespitzt. Elytren weisslich subhyalin, an der Basis und Spitze verbräunt, gelblich nervirt, kurz, weisslich behaart. Pronotum an den Seiten spärlich weisslich behaart. Brust und Bauch schwärzlichbraun, an den Seiten weisslich behaart und punktirt. Beine gelblich, Coxen und Schenkel castanienbraun, Klauen schwärzlichbraun.

Länge: ♂ ♀ 5—5½ mm.

Hab.—Formosa (Koshun); gesammelt in 4 (1 ♂, 3 ♀) Exemplaren vom Verfasser.

Auch bei dieser Art kommen Individuen vor, welche bald die seitlichen Fortsätze besitzen und bald deren ermangeln.

13. *Centrotus (Gargara) genistæ* F.

Membracis genistæ F. Ent. Syst. 4. p. 15 (1794).

Hab.—Hokkaido, Honshu, Kiusiu, Ogasawarajima; Sibirien, Europa, Afrika.

Bei uns kommt die Art häufig auf *Ligustrum*, *Salix*, *Ulmus*, etc. vor.

14. *Centrotus (Gargara) tappanus* n. sp.

Castanienbraun; Scheitel und der Vorderrand des Pronotums schwärzlichbraun; gelblich kurz behaart. Scheitel und Pronotum dicht fein-punktirt, das letztere auf der Scheibe spärlich punktirt; seitliche Fortsätze fehlen ganz, der hintere Fortsatz prismatisch, an der Spitze verbräunt, scharf gekielt und zugespitzt. Elytren hyalin, bei einem Exemplare gelblich getrübt, an der Basis schwärzlichbraun; die Nerven gelblich, die Spitzenrandnerven verbräunt; die Nerven deutlich gekörnt und spärlich gelblich behaart. Brust und Abdomen schwärzlichbraun, an den Seiten dicht fein und gelblich behaart. Beine einfarbig bräunlichgelb, die Coxen castanienbraun.

Länge: ♀ 5 mm.

Hab.—Formosa (Tappan, Horisha); gesammelt in 2 ♀ Exemplaren vom Verfasser.

Der Form nach *C. genistæ* F. etwas ähnlich, aber deutlich länger.

15. *Centrotus (Gargara) dōnitzæ* n. sp.

Schwarz, dicht und fein golden-behaart. Antennen braun; die Borste weisslich, beim ♂ ganz weisslichgelb. Scheitel fein- und Pronotum ziemlich grob-punktirt; seitliche Fortsätze fehlen dem letzteren, nur spurweise gefunden bei einem Exemplare. Der hintere Fortsatz viel länger als der Clavus, prismatisch; der Mittelkiel ziemlich hoch; an der Spitze schmal und scharf zugespitzt, etwas nach unten gebogen. Elytren subhyalin, ein wenig gelblich getrübt, an der Basis schwarz,

grob punktirt; die Nerven blassgelblich, beim ♂ etwas verbräunt in der Mitte; der Apicalrandnerv etwas dunkler. Beine einfarbig gelb, Schenkel beim ♂ unten braun; Klauen dunkel. Bauch beim ♀ gelblich in der Mitte und am Hinterrande jedes Segmentes. Scheidenpolster spärlich grob-punktirt; Genitalplatten beim ♂ gelblich am Rande.

Länge: ♂ ♀ $5\frac{1}{2}$ —6 mm.

Hab.—Honshu (Hakone); gesammelt in 2 (♂ ♀) Exemplaren vom Verfasser.

Der Form nach *C. tipinus* m. ähnlich, aber noch länger und grösser. Diese Art wurde erst von Herrn Dönitz in Tokyo gesammelt.

16. *Centrotus (Gargara) zonatus* n. sp.

Castanienbraun; kurz golden-behaart; Scheitel und der Vorder- rand des Pronotums schwärzlichbraun. Pronotum ohne seitliche Fortsätze, in der Mitte spärlich grob- und an den Seiten dichter fein-behaart. Der hintere Fortsatz prismatisch, etwas länger als der Clavus, an der Spitze etwas verdunkelt. Elytren subhyalin, dunkel getrübt, an der Basis schwärzlichbraun; der Apicaldrittel weisslich-subhyalin und in der Mitte mit einer breiten braunen Querbinde; die Nerven am Innenrande dieser Binde und die Flügelspitze weisslich. Beine gelblichbraun; die Schenkel, die Spitzen ausgenommen, schwärzlich-braun. Brust und Bauch pechschwarz, der letztere sehr kurz und fein grau-behaart. Legescheide gelblichbraun.

Länge: ♀ 3.5 mm.

Hab.—Formosa (Horisha); gesammelt in einem ♀ Exemplare vom Verfasser.

17. *Centrotus (Gargara) arisanus* n. sp.

Schwarz, bräunlich kurzbehaart. Scheitel und Pronotum ziemlich grob punktirt; seitliche Fortsätze fehlen dem Pronotum ganz; der hintere Fortsatz viel gröber punktirt als auf dem Pronotum, die Spitze des Clavus nicht erreichend; der Mittelkiel hoch, in der

Mitte bogig erhoben, an der Spitze scharf zugespitzt. Elytren weisslich subhyalin, deutlich gekörnt und spärlich hellbräunlich behaart, die Nerven gelblich; die Basis und eine am Hinterrande gegabelte schiefe Querbinde beim ♀ schwärzlich, beim ♂ ganz schwarz; nur am Spitzendritteln und an der Clavalspitze hyalin; die Nerven auf der Querbinde dunkler. Unten graulich kurzbehaart. Legescheide nahe an der Basis gelblichbraun. Genitalklappe des ♂ an der Spitze gelblich. Beine schwärzlichbraun; Tibien an der Spitze und Tarsen bräunlichgelb.

Länge: ♂ ♀ 3.5—4 mm.

Hab.—Formosa (Arisan); gesammelt in 6 (2 ♂ 4 ♀) Exemplaren vom Verfasser.

18. *Centrotus guttulinervis* n. sp.

Castanienbraun (♂) oder schwärzlichbraun (♀); der Scheitel bei den heller gefärbten jungen Exemplaren dunkler. Scheitel und Pronotum fein punktirt, weissgelblich kurz behaart. Beim ♀ zwei bräunliche Längsstriemen am Vorderrande des Pronotums; dieselbe Region beim ♂ goldgelblich behaart. Seitliche Fortsätze fehlen dem Pronotum ganz. Der hintere Fortsatz die Spitze des Clavus ganz erreichend, an der Spitze scharf zugespitzt und etwas bogig nach unten gekrümmt. Elytren subhyalin, bräunlichgelb getrübt, an der Basis bräunlich, in der Mitte und an der Spitze weisslich; die Nerven gelblich, mit etwa 35 bräunlichen Körnchen; Clypeus weisslich tomentirt. Beine schwärzlichbraun; Schenkel an jeder Spitze, sowie Tibien und Tarsen, gelblichbraun. Brust und Bauch schwärzlichbraun, letzterer beim ♀ vorwiegend röthlichbraun.

Länge: ♂ ♀ 3.5 mm.

Hab.—Formosa (Horisha); gesammelt in 2 (♂ ♀) Exemplaren vom Verfasser.

19. *Centrotus horishanus* n. sp.

Schwarz, mit kurzen gelblichen Härchen bedeckt. Rostrum gelb-

lich, an der Spitze verbräunt. Scheitel ziemlich fein-, Pronotum ziemlich grob-punktirt. Pronotum ohne seitliche Fortsätze; der hintere Fortsatz die Spitze des Clavus erreichend, viel gröber punktirt als das Pronotum, prismatisch, nach der Spitze zu allmähig scharf zugespitzt, der Mittelkiel gelblich in der Mitte. Elytren hyalin, an der Basis ziemlich weitausgedehnt schwarz; die Nerven bräunlichgelb, mit deutlichen gleichgefärbten Körnchen, spärlich gelblich behaart. Beine einfarbig honiggelb, gelblich behaart; Coxen schwärzlichbraun; die Klauen verbräunt. Bauch fein punktirt, sehr fein grau-behaart; bräunlich am Hinterrande jedes Segmentes.

Länge: ♂ 4 mm.

Hab.—Formosa (Horisha); gesammelt in einem ♂ Exemplare vom Verfasser.

Der Form nach *C. genistae* F. sehr ähnlich, weicht jedoch durch die ganz einfarbig honiggelben Beinen und hyaline Elytren ab.

20. *Centrotus (Gargara) kawakamii* n. sp.

Schwarz, mit gelblichen Härchen bedeckt. Pronotum hellbräunlich. Scheitel und Pronotum grob punktirt. Pronotum ohne seitliche Fortsätze; der hintere Fortsatz kurz, bei weitem nicht die Spitze des Clavus erreichend, der Mittelkiel nahe der Spitze hoch erhebend und dann gegen die Spitze hin scharf zugespitzt. Elytren bräunlich; ein grosser Fleck nahe der Clavalspitze und ein breiter Bogenfleck nahe der Deckspitze weisslich subhyalin; die Nerven schwärzlichbraun, deutlich gekörnt, bräunlich lang-behaart. Beine schwärzlich; Tibien und Tarsen vorwiegend bräunlich, die letzteren etwas heller als die ersteren. Bauch kurz grau-behaart; Scheidenpolster grob punktirt, Legescheide bräunlich nahe der Basis.

Länge: ♀ 4 mm.

Hab.—Formosa (Koshun); ein Exemplar gesammelt von Herrn T. Kawakami und ein anderer vom Verfasser.

Der Form nach *C. variegatus* etwas ähnlich.

Fam. Jassidæ.

Subfam. Megophthalminæ.

Mesoparopia n. gen.

Der Form nach der Gattung *Megophthalmus* Curt. sehr ähnlich, weicht aber in den folgenden Charaktere ab:

1. Flügeldecke mit einer Basalzelle, 2 Discoidal-, 3 Intermediär- und 5 Apicalzellen; der zweite Längsnerv des Clavus an der Spitze fast rechtwinklig abgebrochen.

2. Scheitel sehr kurz, der vordere- und hintere Rand fast bis zum Ende parallel, aber am Ende ganz nahe dem Auge etwas schief abgeschnitten. Es fehlen die zwei seitlichen Leisten welche beim *Megophthalmus* deutlich sind; von der Mitte des Scheitels jederseits geht ein sehr schief gerichteter niedriger Kiel bis zum Innerwinkel des Auges, welcher mit dem Vorderrande eine sehr schmaldreieckige Grube bildet, an deren Spitze die Nebenaugen liegen.

3. Stirn langoval, die Lorae am Aussenrande niedrig und nicht so scharf gekielt wie bei *Megophthalmus*; Clypeus klein, an der Basis stark eingeschnürt.

Dieser neuen Gattung gehören die zwei folgenden Arten: *Mesoparopia nitobei* n. sp. aus Formosa und *M. fruhstorferi* n. sp. aus Tonkin.

1. *Mesoparopia nitobei* n. sp.

♂ schwärzlichbraun; dicht grob-punktirt. Scheitel mit 3 gelblichen Flecken in der Mitte des Vorderrandes und einem gelblichen Fleckchen am Innenrande jedes Auges. Pronotum an der hintere-

ren Hälfte punktirt. Schildchen dunkel, an den beiden Enden der Querfurche gelblich punktirt. Elytren am Costal- und Subcostalfelde deutlich gekörnt; Clavus ziemlich dicht punktirt; die zweite Discoidalzelle am Apicaldritteln sowie die dritte Intermediärzelle weisslich subhyalin. Flügel subhyalin, dunkel getrübt, die Nerven dunkel. Gesicht grob punktirt; Stirn am Vorderteile oval ausgehöhlt; Wangen weisslich gefleckt. Beine dunkelbraun; Coxen an der Spitze, Trochanter vorwiegend, die beiden Enden des Schenkels, die Spitze der hinteren Tibien und die Basis des hinteren Tarsus weisslich.

♂ Genitalplatten lang, an einander liegend, fast parallel, gegen die Spitze hin etwas verbreitert und nach oben gebogen.

♀ Gelblichbraun. Scheitel in der Mitte mit einem gelblichen Flecke. Beine heller als der Grundfarbe. Clavus in der Mitte weisslich gefleckt. Letztes Bauchsegment in der Mitte schwach ausgebuchtet, Scheidenpolster so lang wie das Abdomen.

Länge: ♂ ♀ $5\frac{1}{2}$ —6 mm.

Hab.—Formosa (Tappan, Kammon); gesammelt in 3 (1 ♂, 2 ♀) Exemplaren von Herrn I. Nitobe und vom Verfasser.

T. N.: Nitobe-eguriyokobai.

2. *Mesoparopia fruhstorferi* n. sp.

♀ Gelblichbraun. Scheitel kurz, dunkel, mit 3 gelblichen Flecken; an den beiden Enden des Hinterrandes auch gelblich. Pronotum gelblich dicht und grob punktirt, in der Mitte querrunzelig, an den Seiten ziemlich tief ausgehöhlt. Scutellum sehr fein und spärlich punktirt, mit einer ziemlich tiefe Querfurche, an beiden Enden gelblich gefleckt; die Spitzenhälfte auch gelblich. Elytren dunkelbraun; mit Ausnahme des Apicaldrittels und der Mitte ziemlich tief punktirt; die Nerven dunkel, hier und da weisslich punktirt, die äussere Spitze des Nahtnerven weisslich gefleckt. Gesicht spärlich fein-punktirt; Stirn am Vorderrande und Wangen in der Mitte dunkel; der erstere in der Mitte mit einem gelblichen Flecke; Clypeus gelb. Beine

dunkelbraun; Coxen und Trochanter vorwiegend, Hinterschenkel aber in der Basalhälfte gelblich; Schenkel und Tibien gelblich punktirt. Letztes Bauchsegment mit deutlicher breit-dreieckiger Ausbuchtung; Scheidenpolster gelblich, deutlich kürzer als das Abdomen.

Länge: 7 mm.

Hab.—China (Tonkin); gesammelt in einem ♀ Exemplare von Herrn H. Fruhstorfer.

Der Form nach *M. nitobei* etwas ähnlich, aber viel grösser.

Subfam. Ledrinæ.

Gatt. **Ledromorpha** Stål.

Stål, Ann. Soc. Ent. Fr. (4), 1864, p. 68.

1. *Ledromorpha discolor* Uhl.

Petalocephala discolor Uhl. Proc. U. S. N. Mus., 1896, p. 290.

Hab.—Honshu, Kiushu.

T. N.: Ko-mimitsuku.

Gatt. **Ledra** F.

Fabricius, Syst. Rhyn. 1803, p. 24.

1. *Ledra auditura* Wk.

Ledra auditura Wk. List of Hom. B. M., Suppl. 1858, p. 249.

Hab.—Honshu Kiushu; China.

T. N.: Mimitsuku.

Gatt. **Lepropsis** White.

White, Ann. Mag. Nat. Hist. 1844, p. 425.

1. *Lepropsis formosana* n. sp.

♂ Gelblichbraun. Scheitel dunkelbraun, etwas kürzer als der

Abstand zwischen den Augen, halbkreisförmig, vorn etwas aufgehoben, in der Mitte jederseits mit einer ziemlich tiefen Aushöhlung; runzelig grob punktirt. Stirn vorwiegend gelblich. Pronotum grob punktirt, querrunzelig, mit 3 bräunlichen Längsstriemen, von denen die seitlichen undeutlich sind; deutlich länger als der Scheitel. Scutellum an den Basalwinkeln je mit einem bräunlichen Flecke, grob punktirt wie das Pronotum. Elytren bräunlich, grob punktirt im Clavus; das Costalfeld, die Mitte des Coriums und das Apicalfeld vorwiegend subhyalin und heller. Clavus nahe der Spitze mit einem weisslichen subhyalinen Flecke. Die Nerven von der Grundfarbe, mit bräunlichen Körnchen, die beiden Seiten der Nerven vorwiegend einreihig punktirt. Flügel hyalin, deren Nerven bräunlich. Beine schmutziggelb, Schenkel in der Mitte etwas verdunkelt. Mesopleurae bräunlich, grob punktirt. Bauch und Brust schmutziggelb. Genitalplatten deutlich länger als die vorhergehenden Bauchsegmente zusammen; conisch zuschliessend und etwas aufwärts gebogen.

Länge: ♂ 6 mm.

Hab.—Formosa (Kagi); gesammelt in einem ♂ Exemplare vom Verfasser.

T. N.: Komimitsuku-modoki.

2. *Ledropsis horishana* n. sp.

♂ Blassgrünlichgelb. Scheitel deutlich kürzer als der Abstand zwischen den Augen, vorn bogig abgerundet, am Vorderrande sich etwas aufwärts gehoben, in der Mitte beiderseits je mit einer Aushöhlung, grob punktirt, an den Seiten hellbräunlich. Pronotum viel länger als der Scheitel, hellbräunlich, grob punktirt, quer gerunzelt, mit einer undeutlichen Mittelstrieme, beiderseits nahe dem Vorderrande je mit einer Einstechung. Scutellum spärlich fein-punktirt, in der Mitte mit einer tiefen Querfurche. Elytren subhyalin, grob punktirt; Clavus an der Basis verbräunt; am Apicalfelde feiner punktirt; die Nerven von der Grundfarbe und ziemlich undeutlich. Scheitel unten nahe

dem Hinterwinkel des Auges jederseits mit einem bräunlichen Flecke. Frons fast glatt, in der Mitte etwas spärlich punktirt. Brust, Bauch und Beine einfarbig blassgelblich. Genitalplatten etwas länger als das vorhergehende Bauchsegment, zusammen conisch zuschliessend, etwas aufwärts gebogen.

Länge: 6 mm.

Hab.—Formosa (Horisha); gesammelt in einem ♂ Exemplare vom Verfasser.

T. N.: Horisha-mimitsukumodoki.

3. *Ledropsis vittata* n. sp.

♀ Geblichbraun. Scheitel grob punktirt, fast so lang wie der Abstand zwischen den Augen, vorn schmal abgerundet, in der Mitte gelblich, nahe der Ocelle jederseits vertieft und daselbst verbräunt. Pronotum so lang wie der Scheitel, gröber punktirt, in der Mitte mit einer breiten gelblichen Strieme, welche sich über den Scheitel und das Scutellum fortsetzt; in der Mitte noch mit einer schmalen bräunlichen Strieme; an den Seiten etwas heller als der Grundfarbe. Scutellum gelb, am Vorderwinkel jederseits mit einem bräunlichen Flecke, fein punktirt. Elytren hellbräunlich, hie und da subhyalin; in der Mitte von der Costalmitte bis zur Clavalbasis läuft eine bräunliche Schrägsbinde; die Spitze des Clavus auch bräunlich, grob punktirt; die Nerven von der Grundfarbe und nicht deutlich, mit bräunlichen Körnchen. Scheitel unten schwärzlichbraun, quernadelrissig; Frons und Genae blassgelblich, fast glatt. Pro- und Mesopleurae sehr grob punktirt. Brust, Bauch und Beine blassgelblich; Tibien und Tarsen grünlich beschattet. Scheidenpolster deutlich kürzer als das Abdomen; letztes Bauchsegment am Hinterrande fast gerade.

Länge: ♀ 7.5 mm.

Hab.—Formosa (Horisha, Rinkiho); gesammelt in 2 (♀♀) Exemplaren vom Verfasser.

T. N.: Suji-mimitsukumodoki.

4. *Ledropsis 4-maculata* n. sp.

Rötlichbraun. Scheitel deutlich länger als der Abstand zwischen den Augen, conisch zugespitzt; ziemlich dicht runzelig punktirt, auf der Scheibe deutlich gröber punktirt, in der Mitte mit einem undeutlichen sehr feinen Kielchen. Pronotum viel kürzer als der Scheitel, an der Vorderhälfte fein- und an der Hinterhälfte grob punktirt, am Hinterwinkel querrunzelig. Scutellum grob runzelig punktirt, am Basalwinkel jederseits mit einem bräunlichen Fleckchen, an der Spitzenhälfte querrunzelig. Elytren olivenfarbig, grob punktirt; Clavus, ebenso wie die 2 grosse Flecke, von denen eins in der Mitte des Coriums und ein anderer nahe der Spitze gelegen sind, gelblichbraun; Clavus bräunlich punktirt; das Spitzenfeld des ersten Längsnerven bräunlich gefleckt; die Nerven von der Grundfarbe; Spitzennerven hie und da rötlich. Unterseite blassgelblich, Scheitel fast flach, am Rande rötlichgelb. Beine blassgrünlichgelb, Klauen an der Spitze bräunlich. Scheidenpolster so lang wie das Abdomen; letztes Bauchsegment gerade.

Länge: ♀ 15 mm.

Hab.—Formosa (Kohsun); gesammelt in einem ♀ Exemplare vom Verfasser.

T. N.: Yotsuboshi-mimitsukumodoki.

Gatt. *Petalocephala* Stål.

Stal, Öfv. Vet. Ak. Förh. 1853 p. 266.

1. *Petalocephala angulata* n. sp.

Olivengrün. Schitel grob punktirt, dreieckig, fast so lang wie der Abstand zwischen den Augen; der Spitzenrand beim ♂ bräunlich, deutlich stumpfwinklig; Ocellen rubinrot. Pronotum an der Vorderhälfte fein- und an der Hinterhälfte grob punktirt, sechswinklig, beim ♀ an den Seiten stark spitzwinklig, beim ♂ rechtwinklig hervorragend und der Hinterrand dieser Vorrangung schwärzlichbraun. Scutellum gelblich, grob punktirt, in der Mitte querrunzelig. Elytren subhyalin,

olivengrün, zusammen etwas prismatisch, dicht grob punktirt; die Längsnerven des Clavus heller und mit geringer Anzahl Anstomosen bildenden Quernerven; Vorderrandnerv gelb; die übrigen Nerven von der Grundfarbe, ziemlich stark hervortretend, an der Spitzenhälfte netzartig anastomosirend. Unterseite und Beine blassgelblich, Tibien an der Spitzenhälfte und Tarsen grünlich; Tibialspornen an der Spitze bräunlich.

♂ Genitalplatten deutlich länger als das vorhergehende Bauchsegment, zusammen schmal kegelförmig zugeschlossen und aufwärts gebogen.

♀ Letztes Bauchsegment in der Mitte des Hinterrandes schwach bogig ausgebuchtet; Scheidenpolster so lang wie das Abdomen.

Länge: ♂ 12 mm.; ♀ 17 mm.

Hab.—Formosa (Koshun, Heirimbi); gesammelt in 2 (♂♀) Exemplaren vom Verfasser.

T. N.: Hirata-mimitsuku.

Subfam. Tettigoniinæ.

Gatt. **Tettigonia** Geoff.

Geoffroy, Hist. abr. ins. 1, p. 429 (1862).

1. *Tettigonia viridis* L.

Cicada viridis L. Faun. Suec. sp. 897 (1761).

Hab.—Ganz Japan; China, Sibirien, Europa, Afrika.

T. N.: Ō-yokobai.

F. P.—Thea, Morus, Oryza, Triticum, Panicum und andere niedrige Pflanzen.

2. *Tettigonia ferruginea* F. var. *apicalis* Wk.

Cicada ferruginea F. Ent. Syst. p. 32 (1794).

Tettigonia apicalis Wk. List Hom. p. 736 (1851).

Hab.—Honshu, Shikoku, Kiushu, Riukiu, Formosa, Korea ; China.

T. N. : Tsumaguro-ōyokobai.

F. P.—Thea, Morus und andere niedrige Pflanzen.

3. *Tettigonia formosana* n. sp.

Der Form und Zeichnung nach *T. ferruginea* F. ähnlich, weicht aber in den folgenden Punkten ab :

i. Körper mit den Flytren zusammen viel schmaler als bei *T. ferruginea* F.

ii. Am Uebergange zur Stirn jederseits mit einem bräunlichen Flecke, welcher sich fast bis zur Basis der Stirn erstreckt. Stirn an der Spitze und jederseits an der Basis je mit einem bräunlichen Flecke.

iii. Elytren schmal, an der Spitze dunkelbraun ; auf den Apicalquernerven läuft eine nach aussen gebogene bräunliche Querbinde ; die Membran schmutzigweiss.

iv. Beine schmutziggelb ; Coxen, Trochanter, Schenkel und Tibien an den beiden Enden, Klauenglied an der Spitze und Klauen schwärzlich.

♀ Letztes Bauchsegment in der Mitte deutlich tiefer ausgebuchtet als bei *T. ferruginea*, sodass die seitlichen Vorragungen viel länger und spitziger erscheinen.

Länge : ♀ 13 mm.

Hab.—Formosa (Gyochi bei Horisha) ; gesammelt in einem Exemplare vom Verfasser.

T. N. : Hoso-tsumaguro-ōyokobai.

4. *Tettigonia albida* Wk.

Tettigonia albida Wk. List. Hom. III, p. 767 (1851).

Hab.—Ōshima, Riukiu, Formosa (überall häufig) ; China, Malay, Ceylon.

T. N. : Shiro-ōyokobai.

5. *Tettigonia pallidiola* n. sp.

Der Färbung und Form nach *T. albida* Wk. sehr ähnlich, unterscheidet sich aber von dieser in den folgenden Punkten:

- i. Körper kleiner, von hellgrünlichgelber Farbe.
- ii. Scheitel beim ♀ lang, spitzkonisch hervorragend und ohne den Mittelfleck am Uebergange des Scheitels zur Stirn.
- iii. Pronotum ohne Spur von Mittelflecken, beim ♀ fast so lang wie die Scheitellänge.
- iv. ♂ Genitalplatten an der Basis breit, gegen die Spitze hin aber plötzlich verschmälert und an der Spitzenhälfte fast linienförmig gestaltet. ♀ Letztes Bauchsegment konisch, an der Spitze breit abgerundet, aber viel schmaler als bei *T. albida* Wk.

Länge: ♂ 5.5 mm., ♀ 7 mm.

Hab.—Formosa (Taihoku, Hokuto, Tansui, Kanshirei, Ako, Koshun); gesammelt in zahlreichen Exemplaren. Dieselbe Art habe ich auch in Colombo in 4 Exemplaren (2 ♂, 2 ♀) erbeutet.

T. N.: Hime-shiro ōyokobai.

6. *Tettigonia koshunensis* n. sp.

Weisslichgelb. Scheitel breit konisch, am Uebergange zur Stirn in der Mitte mit einem schwärzlichen runden Flecke, vor der Ocelle jederseits mit einem von etwa 6 kleinen Fleckchen bestehenden bräunlichen Bogenflecke; Ocellen bräunlich. Stirn einfarbig, in der Mitte der Länge nach etwas heller. Pronotum so lang wie die Scheitellänge, an der Hinterhälfte spärlich quernadelrissig. Elytren subhyalin, schmutzigweiss getrübt; die Nerven vorwiegend farblos, aber der Nervus brachialis, der N. cubitalis internus und die die beiden verbindenden Quernerven bräunlich. Beine einfarbig weisslichgelb, Klauen bräunlich.

♂ Genitalplatten breit an der Basis, gegen die Spitze hin schmal werdend, die beiden in der Mitte eine schmale Ellipse umschliessend.

Länge: ♂ 5.5 mm.

Hab.—Formosa (Koshun), gesammelt in einem ♂ Exemplare vom Verfasser.

Der Form und Färbung nach *T. pallidiola* etwas ähnlich.

7. *Tettigonia rinkihonis* n. sp.

Weisslichgelb. Scheitel fast halbkreisförmig, so lang wie der Abstand zwischen den Augen, in der Mitte 2 schwarze Fleckchen in einer Längslinie vorhanden, an den Seiten am Uebergange zur Stirn je ein bräunliches Fleckchen. Stirn einfarbig weisslichgelb, ziemlich hoch gewölbt. Pronotum etwas länger als die Scheitellänge, fast subhyalin, sodass die 3 unterliegende schwärzliche Flecke durchsichtbar sind. Scutellum an der Wurzel jederseits mit einem schwarzen ovalen Flecke, dessen vordere Hälfte vom subhyalinen Pronotum bedeckt wird. Elytren subhyalin weisslichgelb, die Nerven von der Grundfarbe und nur wenig hervortretend. Flügel dunkel angeraucht, an der Costa schmal weisslich. Rostrum und ein Seitenfleck der Prolpeuræ schwärzlich. Beine einfarbig weisslichgelb, Klauen an der Innenseite dunkel. ♂ Genitalplatten länglichoval, an der Spitze breit konisch, an den Seiten lang gelblichweiss behaart.

Länge: ♂ 9 mm.

Hab.—Formosa (Rinkiho); gesammelt in einem ♂ Exemplare vom Verfasser.

T. N.: Rinkiho-ōyokobai.

8. *Tettigonia horishana* n. sp.

Dunkelbraun. Scheitel etwas kürzer als der Abstand zwischen den Augen, in der Mitte mit einer gelblichen Längsbinde, welche sich am Vorderrande verbreitert und darauf mit 2 bräunlichen Längsflecken versehen sind; am Hinterrande mit 2 bräunlichen Flecken. Ocellen schwärzlich, ihre Umgebung hier und da gelblich. Stirn hoch gewölbt, kurzoval, an der Spitze weisslich, in der Mitte jederseits mit einem weisslichen Längsflecke und Punkten. Clypeus, Zügel, Rostrum

und Beine weisslich. Klauen dunkel. Pronotum etwa so lang wie die Scheitellänge, in der Mitte mit einer weisslichen Längsbinde, an den Seiten mit weisslichen Fleckchen besät. Scutellum hellbräunlich, mit einem von der Basis bis zur Quersfurche ziehender Fleck; ein seitliches Fleckchen und die scharfe Spitze weisslich. Elytren bräunlichrot, mit helleren Fleckchen gesprenkelt, an der Spitze und die Membran dunkel; Clavus bei einigen Exemplaren grünlich; die Nerven von der Grundfarbe und nur wenig hervortretend. Flügel dunkel, die Nerven etwas tiefer in der Färbung. ♂ Genitalplatten weisslich, lang, an der Basis breit, an der Spitze zugespitzt, zusammen schmal konisch zuschliessend. Letztes Rückensegment lang, 2 mal länger als die Genitalplatten. ♀ Scheidenpolster lang, fast so lang wie das Abdomen, ebenso wie die Legescheide schmutzigweiss, an der Spitze blassgelblich borstig behaart.

Länge: ♂ ♀ 8-8.5 mm.

Hab.—Formosa (Horisha, Hoppon); gesammelt in 6 (5 ♂, 1 ♀) Exemplaren von Herrn I. Nitobe und vom Verfasser.

T. N.: Horisha-ōyokobai.

9. *Tettigonia hopponis* n. sp.

Oben schwarz, unten weisslich. Scheitel fast halbkreisförmig, so lang wie der Abstand zwischen den Augen; nahe am Hinterrande mit 4 karmoisinroten Flecken, von denen die 2 seitlichen deutlich grösser und je mit einem schwärzlichen Fleckchen versehen sind; am Uebergange zur Stirn ein gabelförmiger roter Fleck. Stirn an der Spitze beiderseits mit einem rhombischen schwarzen Flecke; an der Innenseite jeder Antenne ein schwärzliches Fleckchen. Pronotum ein wenig länger als die Scheitellänge, mit 5 roten Längsflecken, in einiger Entfernung vom Vorderrande, woselbst jederseits ein rotes Fleckchen vorkommt. Scutellum schmutziggelb, am Basalwinkel weit ausgedehnt dunkel, 2 Flecke in der Mitte und die Quersfurche dunkel. Elytren dunkel, die Nerven schwarz, deutlich hervortretend; mit 3 den

Apicalrand nicht erreichenden rötlichen Längsbinden, von denen die mittlere in der Mitte unterbrochen ist; an der Spitze etwas tiefer in der Färbung. Flügel rauchbraun, die Nerven tiefer in der Färbung. Pro- und Mesopleurae ebenso wie die 2 Flecke auf Mesosternum schwärzlich. Beine weisslich, Klauen bräunlich. Bauch gelblichweiss.

♂ Genitalplatten gelblichweiss, an der Spitze bräunlich ange-
raucht, zusammen konisch zuschliessend, an den Seiten und an der
Spitze bräunlich spärlich kurz behaart; letztes Rückensegment ein
wenig länger als die Genitalplatten.

Länge: ♂ 9.5 mm.

Hab.—Formosa (Hoppe); gesammelt in einem ♂ Exemplare vom
Verfasser.

T. N.: Akasugi-ōyokobai.

10. *Tettigonia fusca* Mats.

Tettigonia fusca Mats., Journ. Coll. Agr., Tohoku Univ., Sapporo,
VI, pt. 1, p. 23 (1911).

Hab.—Sachalin (Corsacoff).

T. N.: Kuro-ōyokobai.

Gatt. **Euacanthus** Lep. et Serv.

Leprieur et Serville Enc. Meth. X. p. 612 (1825).

1. *Euacanthus interruptus* L.

Cicada interrupta L. Faun. Suec. p. 889 (1761).

Hab.—Sachalin, Hokkaido, Honshu; Sibirien; Europa.

T. N.: Kisuji-kammuri-yokobai.

2. *Euacanthus nigricans* Mats.

Euacanthus nigricans Mats., Journ. Coll. Agr. Tohoku Univ.
Sapporo, p. 20 (1911).

Hab.—Sachalin, Hokkaido, Honshu.

T. N. : Kuro-kammuri-yokobai.

var. *pallidus* n.

Blassgelblich. Stirn schwarz. Scheitel in der Mitte mit 2 schwarzen Flecken. Pronotum vorn und an den Seiten bräunlich gefleckt. Andere Charaktere wie bei der Stamm-Art.

Hab.—Hokkaido, Honshu.

3. *Euacanthus myakei* Mats.

Euacanthus myakei Mats., Journ. Coll. Agr. Tohoku Univ. Sapporo, p. 21 (1911).

Hab.—Sachalin.

T. N. : Myake-kammuri-yokobai.

4. *Euacanthus ogumæ* Mats.

Euacanthus ogumæ Mats. Journ. Coll. Agr. Tohoku Univ. Sapporo, p. 21 (1911).

Hab.—Sachalin.

T. N. : Oguma-kammuri-yokobai.

5. *Euacanthus acuminatus* F.

Cicada acuminata F. Syst. Rhyn. p. 76 (1803).

Hab.—Honshu (Towada).

T. N. : Towada-kammuri-yokobai.

6. *Euacanthus breviceps* n. sp.

Schwarz. Scheitel so lang wie der Abstand zwischen den Augen, stumpfwinklig, am Hinterrande und vor den Antennen gelblich. Stirn gelblich, an der Spitze mit einem und unten beiderseits mit 2 schwarzen Flecken, von denen der Spitzenfleck sich als eine schmale Linie bis zur Stirnbasis fortsetzt. Pronotum deutlich länger als die Scheitellänge, nahe dem Vorderrande jederseits mit einer blassgelblichen Querbinde, an der Hinterhälfte quernadelrissig. Elytren

viel länger als der Hinterleib; schwarz, mit 2 geraden gelblichen Längsstriemen, von denen die am Costalrande gelegene nach aussen verbreitert, während die zweite an der Nahtregion gelegene sich nach aussen verschmälert. Flügel dunkelbraun. Mesosternum, Pleurac und Metasternum blassgelblich. Rostrum und Beine blassgelblich; Tibien und Tarsen vorwiegend schwärzlich. ♂ Genitalplatten, etwa 4 mal so lang wie das letzte Bauchsegment, schmal, gegen die Spitze hin allmählig schmaler werdend, bräunlich, hellbräunlich kurz beborstet.

Länge: ♂ 7.5 mm.

Hab.—Formosa (Rinkihō); gesammelt in einem ♂ Exemplare vom Verfasser.

T. N.: Ikubi-kammuri-yokobai.

7. *Euacanthus formosanus* n. sp.

Blassgelblich. Scheitel spitzdreieckig hervorragend, deutlich länger als der Abstand zwischen den Augen, in der Mitte nahe der Spitze mit einem am Vorderrande etwas ausgebuchteten schwarzen Flecke, am Schenkelrande jederseits mit einem kleineren Flecke. Stirn einfarbig gelblich, in der Mitte jederseits mit einem schwarzen Flecke. Pronotum gelblich, fast so lang wie die Scheitellänge, am Vorder- und Hinterrande in der Mitte je mit einem schwarzen Fleckchen, beiderseits am Hinterwinkel mit einem etwas grösseren Flecke. Scutellum ohne Zeichnung. Elytren viel länger als der Leib, subhyalin, orangengelb; in der Mitte von der Basis zur Spitze läuft eine nach aussen etwas breiter werdende, bräunliche Längsbinde; an der Spitze bräunlich angeraucht; die Nerven wie die Grundfarbe und nur wenig auftretend. Flügel dunkelbraun. Unterseite und Beine gelblichweiss, die Klauen bräunlich.

♂ Genitalplatten schmal, etwa 3 mal so lang wie das letzte Bauchsegment, ein wenig nach oben gebogen, kaum behaart.

♀ Letztes Bauchsegment deutlich länger als das vorhergehende

Bauchsegment, am Hinterrande kaum ausgerandet; Scheidenpolster lang, Legescheide noch länger und an der Spitze verbräunt.

Länge: ♂ ♀ 7-7.5 mm.

Hab.—Formosa (Hoppono); gesammelt in 3 (2 ♂, 1 ♀) Exemplaren vom Verfasser.

T. N.: Hosokammuri-yokobai.

Gatt. **Epiacanthus** Mats.

Matsumura, Journ. Coll. Agr. Tohoku Univ. Sapporo, p. 22 (1911).

1. *Epiacanthus straminea* Motsch.

Deltocephalus stramineus Motsch. Etud. Ent. p. 24 (1861).

Hab.—Sachalin, Hokkaido, Honshu; Sibirien, Amurland.

T. N.: Futaten-togari-yokobai.

2. *Epiacanthus guttiger* Uhl.

Tettigonia guttiger Uhl. Proc. U. S. N. Mus. p. 294 (1896).

Hab.—Hokkaido, Honshu, Kiushu.

T. N.: Kuwa-yokobai.

var. *dispar* Horv.

Tettigonia guttiger var. *diapar* Horv. Term. Füzet. p. 371 (1899).

Hab.—Hokkaido, auf Maulbeerbaume.

3. *Epiacanthus nigrinus* Mats.

Epiacanthus nigrinus Mats., Journ. Coll. Agr. Tohoku Univ. Sapporo, p. 22 (1911).

Hab.—Sachalin.

T. N.: Kuro-togari-yokobai.

Gatt. **Ishidælla** n. Gen.

Der Form nach zum Teil *Tettigonia* und zum Teil *Euacanthus* ähnlich.

Körper lang gestreckt. Kopf mit dem Augen zusammen etwas breiter als das Pronotum. Scheitel parabolisch vorragend, ohne Mittel- und Querleisten. Ocellen dem Hinterrande des Scheitels etwas genähert, von einander etwas weiter entfernt als von den Augen. Stirn in der Mitte flach, ohne Mittelkiel. Pronotum und Scutellum ziemlich gross. Elytren länger als das Abdomen; die Nerven vorwiegend undeutlich punktirt; erster Sektor undeutlich, nahe der Wurzel gegabelt, der äussere Ast nahe dem Ende abermals geteilt und eine undeutliche längliche erste Anteapicalzelle bildend; der 2te Sektor der Clavalspitze verbunden mit dem Umfangsnerven durch einen deutlichen Quernerven; am Ende vier Endzellen, von denen die erste Zelle undeutlich ist. Flügel wie bei *Tettigonia*.

1. *Ishidælla albomarginata* Sign.

Tettigonia albomarginata Sign. Ann. Soc. Ent. Fr. 1853, p. 347.

Tettigonia semiglaucæ Leth. Ann. Ent. Bruss. 1876, p. 82.

Euacanthus angustatus Uhl. Proc. U. S. N. Mus. 1896, p. 293.

Hab.—Hokkaido, Honshu, Kiushu, Formosa; Sibirien, China, Malay, Neu Holland.

T. N.: Mayejiro-ōyokobai.

Form und Zeichnung sehr veränderlich. In Formosa kommt sie häufig vor, und ist aller verschiedenen Kulturpflanzen schädlich.

Gatt. *Tylozygoides* n. gen.

Der Form nach *Tylozygus* Fieb. etwas ähnlich. Scheitel in der Mitte mit einer Längsleiste, welche von einer undeutlichen Querleiste durchkreuzt wird. Ocellen dem Hinterrande etwas genähert, gleich entfernt von den Augen und der Mitte des Scheitels. Stirn ziemlich hoch gewölbt, ohne Mittelkiel. Der erste Sektor der Decken nahe der Wurzel gabelig geteilt; ohne Anteapicalzelle; am Ende mit einer Reihe von 4 Endzellen, von denen die vierte sehr gross und

lang ist. Der Nervenverlauf auf der Flügel fast wie bei *Tettigonia*. Diese Gattung weicht von *Tylozygus* in den folgenden Charaktere ab:

- i. Scheitel viel länger.
- ii. Unterhalb der Fühlergrube bis zum Clypeus ohne Schwiele.
- iii. Ocellen mehr an einander genähert.
- iv. Der dritte Sektor der Flügel verbunden mit dem zweiten durch einen Schiefen Quernerv, während derselbe bei *Tylozygus* ganz frei ist.

1. *Tylozygoides artemisiae* n. sp.

♂ Oben schwarz, bläulich bestäubt, unten einfarbig hellgelb. Scheitel dunkel, am Vorderrande parabolisch abgerundet, kürzer als der Abstand zwischen den Augen, in der Mitte eine gegen die Spitze hin verbreiterte gelbe Längslinie, die fast in der Mitte durch einen gelben kurzen Querstrich gekreuzt wird. Am Uebergange zur Stirn befinden sich an den Seiten drei gebogene gelbliche Schrägsstrichen. Stirn bei einigen Exemplaren in der Mitte gegen die Spitze hin mit einem breiten kurzen dunklen Striche versehen; die gelblichen Striche nur an den Seiten sichtbar. Pronotum sehr fein querrunzelig. Scutellum gelb, mit Ausnahme der dunklen Wurzel und Spitze. Decken schwarz, bläulich bestäubt, am Vorderrande mit zahlreichen subhyalinen weissgelblichen Fleckchen, in der Mitte mit einem grossen und in jeder Apicalzelle mit einem kleinen hyalinen Flecke. Hinterflügel dunkel. Beine hellgelb, Klauen schmutziggelb.

♂ Genitalklappe fehlt; Genitalplatten schmal, säbelförmig, aufwärts gebogen, am Ende zugespitzt. Die fast kegelförmigen und am Ende abgerundeten Vorrangungen des Rückensegmentes so lang wie die Genitalplatten.

♀ Letztes Bauchsegment 3 mal so lang wie das vorhergehende, am Hinterrande abgerundet.

Länge: ♂ ♀ 5.5-6 mm.

Hab.—Hokkaido, Honshu, Formosa; gesammelt in zahlreichen Exemplaren auf *Artemisia*-Arten vom Verfasser.

T. N. : Yomogi-ōyokobai.

Gatt. **Onukia** n. Gen.

Scheitel langkonisch, in der Mitte und an den Seiten ziemlich hoch gekielt, auch am Randschenkel mit einem deutlichen Kiele, welcher mit dem Seitenkiele ein schmales Dreieck umschliesst. Ocellen ausser dem Seitenkiel nahe der Mitte. Stirn konisch, gewölbt, in der Mitte mit einem Längskiele, an den Seiten je mit einer Reihe von Querfurchen. Clypeus etwa $\frac{1}{3}$ so lang wie die Stirn, gegen die Spitze hin etwas verschmälert; Zügel schmal; Pronotum und Scutellum von fast gleicher Länge, aber etwas kürzer als der Scheitel. Elytren deutlich länger als das Abdomen; N. cub. externus etwa am zweiten Dritteln der Flügel gegabelt; 2. ter Sektor fast in der Mitte durch einem Quernerven mit den 3ten verbunden; mit einer Area antecapicalis und vier Area apicalis. Flügel mit fast gleichem Nervenverlauf wie bei *Tettigonia*, nur die Quernerven noch mehr die Mitte des Flügels annähernd.

1. *Onukia onukii* n. sp.

Schwarz. Scheitel längsrunzelig, in der Mitte convex, $1\frac{1}{2}$ -mal so lang wie der Abstand zwischen den Augen, vor dem Auge je mit einem gelblichen Bogenfleck. Antennen gelblich. Clypeus und Zügel mit Ausnahme der Basis und Rostrum gelblich. Pronotum etwas kürzer als die Scheitellänge, querrunzelig. Scutellum in der Mitte vertieft, etwas heller als die Grundfärbung. Elytren schwarz, der Costaldrittel weisslich subhyalin, gegen die Basis hin allmähig schmal werdend, in der Mitte mit einem schwärzlichen Schrägs-triche, am Apicalvierteln mit einem weisslichen Quers-fleck, die Umgebung der Clavalspitze meistens weisslich. Flügel dunkel; Brust, Bauch und Beine weisslichgelb; Klauen hellbräunlich. Abdominalrücken schwarz; die Ränder und die Basis gelblichweiss.

♂ Genitalplatten schmal, etwas nach oben gebogen, weisslich beborstet.

♀ Letztes Banchsegment in der Mitte schwarz, am Hinterrande gerade; Scheidenpolster dunkelbraun, hellbräunlich behaart, Legescheide braun.

Länge: ♂ ♀ 5.5-6 mm.

Hab.—Hokkaido, Honshu, Kiushu; gesammelt in zahlreichen Exemplaren vom Verfasser.

Diese Art wurde auch von Herrn Fruhstorfer in Tonkin erbeutet.

T. N.: Onukiyokobai.

2. *Onukia arisana* n. sp.

Der Zeichnung nach *O. onukii* sehr ähnlich, weicht, aber von dieser in den folgenden Charakteren ab:

- i. Scheitel längsnadelrissig, viel tiefer ausgehöhlt und in der Mitte nicht convex.
- ii. Clypeus, Zügel und Wangen ganz schwarz.
- iii. Pronotum gröber querrunzelig, deutlich punktirt.
- iv. Scutellum an der Basalhälfte grob runzelig.
- v. Elytren deutlich punktirt, Costalfeld fast bis zum Ende weisslich subhyalin, nahe der Spitze beim ♀ mit einem und beim ♂ mit zwei dunklen Flecken.
- vi. Hintertibien an der Spitze dunkel.
- vii. ♂ Genitalklappe gelblichweiss, fast gerade, jede etwas länger als bei *onukii*.

♀ Scheidenpolster und Legescheide viel länger als bei *onukii*.

Länge: ♂ 6 mm., ♀ 7 mm.

Hab.—Formosa (Arisan, Toroen); gesammelt in 2 (♂ ♀) Exemplaren vom Verfasser.

T. N.: Mayejiro-onukiyokybai.

3. *Onukia flavifrons* n. sp.

Der Zeichnung und der Form nach *O. onukii* sehr ähnlich, unter-

scheidet sich aber von dieser in den folgenden Punkten :

i. Scheitel kürzer, nicht so zugespitzt wie bei *onukii*; in der Mitte mit einer nach der Basis zu verbreiterten weissgelblichen Längslinie, welche sich in den breiten gelblichen Pronotallängsfleck fortsetzt.

ii. Gesicht ganz gelblich.

iii. Pronotum feiner quernadelrissig.

iv. Scutellum gelblich, am Basalwinkel jederseits weit ausgedehnt dunkel.

v. Elytren schwärzlichbraun, Clavus schmutziggelb, am zweiten Dritteln des Costalfeldes weisslich subhyalin, an der Spitze dunkel aber heller an der Innenseite.

vi. ♀ Letztes Bauchsegment in der Mittel nicht verbräunt; Scheidenpolster an der Basis schmutziggelb, kürzer als die Legescheide.

Länge : ♀ 6 mm.

Hab.—Formosa (Rinkiho, Toroen); gesammelt in 2 (♀ ♀) Exemplaren vom Verfasser.

T. N. : Sesuji-onukiyokobai.

Catt. **Oniella** n. Gen.

Type : *Oniella leucocephala* Mats.

Zu dieser Gattung gehört auch *Tettigonia honesta* und *excelsa* Melich., Ann. M. Z. St. Pet. p. 125-132 (1902).

Kopf mit den Augen zusammen so breit wie der Hinterrand des Pronotums. Scheitel lang, 5-eckig, nicht gekielt, am Schenkelrande schwach gekielt, vor dem Auge am breitesten, stumpfwinklig vorragend und nahe dem Winkel jederseits mit einer Ocelle. Stirn längs in der Mitte deutlich gekielt, nahe der Mitte etwas gewölbt; Zügel schmal. Pronotum so lang wie der Scheitel, am Hinterrande schwach bogig ausgerandet. Scutellum so lang wie das Pronotum, in der Mitte mit einer Querfurche. Decken lang, ohne Randanhang. Die Sektoren undeutlich, nur durch Punktenreihen angedeutet; keine

Quernerven ausser Apicalquernerven; Endzellen 4, der Costalquernerv fast gerade. Flügel fast wie bei *Onukia*, nur die Mittelquernerven etwas mehr der Spitze angenähert. Beine wie bei *Onukia*.

1. *Oniella leucocephala* n. sp.

Weisslichgelb. Pronotum und Scutellum schwärzlich. Scheitel etwas länger als der Abstand zwischen den Augen, fast flach, in der Mitte etwas concav. Pronotum glatt, sehr fein nadelrissig. Scutellum an der Spitze gelblich, in der Mitte sehr fein runzelig. Elytren viel länger als das Abdomen, schwarz; beim ♂ 2 ovale weissliche Flecke auf der Naht der zusammengeschlossenen Decken. Costalfeld, die Spitze ausgenommen, ziemlich weit ausgedehnt weisslich subhyalin; an der Spitzenhälfte mit 3 schwarzen Schrägsbinden; beim ♀ die schwarze Flecke und Binden sind viel kleiner und schmaler, während die Spitze hellgelblich ist, auf drittem Apicalquernerven ein bräunliches Fleckchen. Flügel am Apicaldritteln dunkel, beim ♀ nur an der Spitze angeraucht. Beine weisslichgelb, Hintertibien an der Spitze und die ganze Klauen dunkelbraun. ♂ Genitalplatten dunkel, an der Basalhälfte weisslich, lang, Apical-zweidritteln schmal, nach oben gebogen, weisslich behaart.

♀ Letztes Bauchsegment zweimal so lang wie das vorhergehende, am Hinterrande gerade. Scheidenpolster an der Spitze schwärzlich, Legescheide etwa $\frac{1}{3}$ länger als die Scheidenpolster; der hervorragende Teil hellbräunlich.

Länge: ♂ 5.5 mm., ♀ 7 mm.

Hab.—Hokkaido, Honshu und Kiushu; gesammelt in zahlreichen Exemplaren vom Verfasser.

In der Zeichnung *O. honesta* Melich. sehr ähnlich.

T. N.: Shirozu-ōyokobai.

2. *Oniella niisimae* n. sp.

Der Zeichnung und der Form nach *O. leucocephala* sehr ähnlich,

weicht aber in den folgenden Punkten ab :

- i. ♀ Viel kleiner.
- ii. Pronotum weisslichgelb, nur am Hinterrande bräunlich.
- iii. Elytren schwarz, an der Clavalspitze mit einem weisslichen Flecke; bei zusammengeschlossenen Decken ein ovaler Fleck; die Basis der Costa und die Spitzenhälfte der Elytren gelblichweiss subhyalin, nahe der Spitze am Costalrande mit 2 schwarzen Querstrichen; an der Spitze bräunlich, am Rande schwärzlich, auf dem dritten Apicalquernerven mit einem schwärzlichen Flecke, welcher an der Aussenseite mit einem hyalinen Fleckchen versehen ist. Flügel weisslich subhyalin, an der Spitze dunkel.

Die übrigen Charaktere fast wie bei *O. leucocephala*.

Länge: ♀ 6 mm.

Hab.—Hokkaido (Jozankei); gesammelt in zwei ♀ Exemplaren von Herrn Prof. Y. Niisima.

T. N.: Niisima-ōyokobai.

Gatt. **Penthimia** Germ.

Germar, Mag. IV. p. 46 (1821).

1. *Penthimia nitida* Leth.

Penthimia nitida Leth., Ann. Ent. Bruss. p. 82 (1876).

Hab.—Honshu, Shikoku, Kiushu; Sibirien.

T. N.: Kuro-maruyokobai.

var. *maikensis* n.

Körper kleiner und kürzer als die typische Art. Pronotum, Scutellum und Elytren vorwiegend gelblichbraun, bei einem Exemplare die Mitte des Pronotums mit einer weissgelblichen Querbinde versehen. Scutellum an der Spitze und an den Seiten weisslichgelb. Vordersehenkel an der Spitze und Vordertibien oben weisslichgelb.

Hab.—Honshu (Maiko, Fuji); gesammelt in 2 ♀ Exemplaren vom Verfasser.

2. *Penthimia formosana* n. sp.

Der Form nach *P. nitida* Leth. ähnlich, unterscheidet sich aber wie folgt:

i. Körper viel schmaler, in der Mitte kaum verbreitert; Färbung matt.

ii. Scheitel dichter punktirt, am Uebergange zur Stirn viel gröber und weniger querrunzelig.

iii. Pronotum grob querrunzelig, nicht glänzend.

iv. Scutellum überall deutlich punktirt, ohne weissliche Punkte.

v. Elytren fein-körnig punktirt, hellbräunlich ziemlich dicht und kurz behaart, in der Mitte nicht verbreitert; die Membran an der Spitze hellgelblichbraun.

vi. ♀ Letztes Bauchsegment am Hinterrande in der Mitte konisch hervorragend und an den Seiten 2 rundliche Ausbuchtungen darbietend.

Länge: ♀ 5 mm.

Hab.—Formosa (Shoka, Tappan, Horisha, Koshun); gesammelt in 4 ♀ Exemplaren vom Verfasser.

T. N.: Taiwan-maruyokobai.

3. *Penthimia guttula* n. sp.

Gelblichbraun, unten schwarz. Scheitel spärlich fein-punktiert, am Uebergange zur Stirn grob querrunzelig; vor der Ocelle meistens mit einer schwärzlichen Querbinde. Pronotum fast glatt, sehr undeutlich querrunzelig, am Vorderrande ein wenig ausgedehnt schwärzlich; auch hinter der Mitte jederseits mit einem schwarzen Punkte. Scutellum meistens schwarz, feinkörnig punktirt, am Spitzendritteln mit 3 schmalen Querfurchen, an der Spitze und an den Seiten hellbräunlich gefleckt. Elytren hellgelblichbraun und schwärzlich reticulirt, nahe der Mitte verbreitert, an der Spitze subhyalin; das Geäder bräunlich. Beine schwarz, Schenkelspitzen und Mitteltibien oben gelblich. Bauch vorwiegend gelblichbraun, hie und da bräunlich gefleckt.

♂ Genitalklappe sehr kurz, undeutlich. Genitalplatten zusammen kurz-dreieckig, zugespitzt, an der Spitze nach oben gebogen; letztes Rückensegment breit, fast rechtwinklig ausgebuchtet, die seitlichen Lappen so lang wie die Genitalplatten.

♀ Letztes Bauchsegment fast wie bei *P. formosana*.

Länge: ♂ ♀ 5 mm.

Hab.—Formosa (Horisha, Rinkiho, Taipin, Kuyania und Tappan); gesammelt in 5 (1 ♂ 4 ♀) Exemplaren vom Verfasser.

Der Zeichnung und Form nach *P. nitida* var. *maikensis* etwas ähnlich.

T. N.: Chairo-maruyokobai.

4. *Penthimia flavinotum* n. sp.

Glänzend schwarz. Scheitel sehr spärlich fein punktirt, am Uebergange zur Stirn sehr fein querrunzelig; hinter der Ocelle eine schmale Querfurche. Pronotum gelb, am Vorderrande schwarz, die schwarze Region am Hinterrande mit zwei Vorragungen; überall sehr fein querrunzelig. Scutellum an der Vorderhälfte runzelig punktirt, an der Hinterhälfte am Rande gelblich, in der Mitte querrunzelig. Elytren schmutziggelb, glänzend; die Nerven hellbräunlich, hier und da mit zerstreuten undeutlichen hellgelichen Fleckchen markirt. Beine schwarz, Schenkel an der Spitze gelblich.

♀ Letztes Bauchsegment am Hinterrande wie bei *P. formosana*, aber die mittlere Vorragung deutlich kürzer.

Länge: ♀ 4.5 mm.

Hab.—Formosa; gesammelt in einem Exemplare vom Verfasser.

T. N.: Kiobi-maruyokobai.

5. *Penthimia theae* n. sp.

Hellgraubraun, etwas grün einspielend, unten schwarz. Scheitel gelblichbraun, deutlich kürzer als das Pronotum, hinter der Ocelle eine obige Querfurche; vor dieser Querfurche sehr fein querrunzelig;

bräunlich sehr fein reticulirt. Pronotum undeutlich, sehr fein quer-runzelig, mit feinen wellenartigen Querstrichen bräunlicher Farbe. Scutellum netzartig bräunlich fein gefleckt. Elytren weisslichgrau, subhyalin, hie und da gruppenweise mit schwärzlichen Atomen gesprenkelt, Clavalspitze so wie die erste und dritte Anteapicalzelle je mit einem schwarzen Fleckchen; Nerven hellgelblich, schwärzlich scheckirt. Bauch an den Seiten rötlichgelb, bei einem Exemplare der Bauch vorwiegend gelblich. Beine schwarz; Schenkelspitzen, Tibien und Tarsen vorwiegend gelblich; Vordertibien schwärzlich punktirt, Mitteltibien an der Basis schwarz; Hintertibien schwarz, Hintertarsen an der Spitze jedes Gliedes schwärzlich.

♂ Genitalklappe kurz, am Rande abgerundet; Genitalplatten schmutziggelb, zusammen an der Spitze abgerundet, fast halbkreisförmig.

♀ Letztes Bauchsegment 4 mal länger als das vorhorgehende, am Hinterrande fast gerade; Scheidenpolster an den Seiten gelblich, 2 mal länger als das letzte Bauchsegment; Legescheide an der Spitze weisslichgelb.

Länge: ♂ ♀ 3.5-4 mm.

Hab.—Formosa (Ampeichin); gesammelt in 5 (2 ♂ 3 ♀) Exemplaren auf *Thea*-pflanzen vom Verfasser.

T. N.: Cha-maruyokobai.

On the system of Phyllophorinæ with descriptions of the species found in Japan.

By

Hiroshi Ohshima, *Rigakushi*.

With Plate I and 7 textfigures.

Having discovered in the Holothurian material at my disposal a number of specimens referable to the interesting species *Pseudocucumis japonicus* (BELL), my attention was directed to the comparative study of tentaculation in the so-called "polychirotous" Cucumarids. In the present paper will be given my views concerning the system of the group, arrived at from my studies, to be followed with descriptions of the species found in the Japanese waters.

I. On Tentaculation and its Bearing on the System of Cucumariidæ.

1. Observations.

i. *Pseudocucumis africanus* (SEMPER).

A goodly number of specimens belonging to this species stood at my disposal, so that my observations on tentaculation were made chiefly on it.

In regard to number, size and arrangement of tentacles in this species, records have been given by LUDWIG [24, p. 1237, Taf. XV., Fig. 16; 26, p. 96, Fig. 11], BEDFORD [4, p. 844, figs. III, B—E] and MITSUKURI [32, textfig. 52]. According to these authors, the two small tentacles, situated in a pair in the midventral radius, are either equal to each other in size and stand side by side, or are of different sizes, in which case the smaller is situated at a position

inner to the larger. With regard to this point I have examined thirty-seven individuals, in all which the arrangement of tentacles, with their well protruded oral parts, could be easily made out. Of them there were found only two individuals which showed a mid-ventral pair of small tentacles of about equal size, standing side by side. One of these individuals was abnormal in that it possessed an extra tentacle, making in all twenty-one tentacles. In all the remaining thirty-five specimens, I have invariably found the tentacles regularly arranged in a way which differed from the statements of the three authors mentioned above.

Of the twenty tentacles they possess, ten are large, five medium-sized, and the remaining five small. Each pair of the large tentacles (textfig. 1, D_1 , V_1 , R_1 and L_1) is interradian in position and alternates with a pair which consists of a medium-sized (D_2 or R_2) and a small (V_2 or L_2) tentacle. In the paired lateral radii the small tentacle (V_2) stands always ventral to the medium-sized (D_2), while in the mid-ventral radius the small one (L_2) is situated to the left of a medium-sized (R_2). This agrees with ÖSTERGREN's description of his *Pseudocucumis mixta* [33, p. 135, and 36, p. 3], excepting the fact that in my specimens the five small tentacles form an inner circle to the remaining fifteen.

As to the position of the anterior notch in each radial segment of the calcareous ring of the species, SEMPER [42, p. 53] remarked that it is situated "auf einer Seite" in each of the paired radial segments, but in the midventral segment so as to divide this into two equal halves. But for my specimens of *Ps. africanus* I have found ÖSTERGREN's statements as regards the anterior notches in his *Ps. mixta* [36, p. 5] to hold true in essential points. The anterior end of each radial segment of the calcareous ring is divided by a deep notch, through which the radial canal and nerve pass, into two unequal halves, one broader than the other (textfig. 4). Again, each of the two halves has on its anterior margin a slight incision or

notch corresponding to the canals of the smaller tentacles. In the paired radial segments the broader half is always dorsal to the narrower. The unpaired midventral radial segment is congruent in form with the segments of the right side, that is to say, the broader half of it lies to the right of the narrower (textfig. 1).

The manner of branching of tentacular canals, as made out from serial sections through pharyngeal mass of several specimens, seems to be as follows:—

Each radial canal, or the “main canal” as THÉEL has called it [45, p. 135], gives off alternately four tentacular canals (textfig. 1). The first tentacular canal branches out dorsad in paired radii, and to the right in the midventral radius. The second arises on the opposite side at a point just slightly anterior to the point where the first is given off, directed ventrad in paired radii but to the left in the midventral radius. These two canals run nearly transversely, and approaching the margin of radial segments, open each into an expanded part of the tentacular canal by a narrow orifice guarded by the ventilative apparatus or “semilunar valves” in a manner similar to that described for *Cucumaria planici* (BRANDT) by HÉROUARD [15, pp. 580—583]. That expanded part of the canals communicates with the large tentacles (D_1 , V_1 , R_1 and L_1), and is interposed between a radial segment and an adjoining interradiar segment. The third branch, which is smaller than the two preceding and supplies the medium-sized tentacles (D_2 and R_2), leaves the radial canal a short distance anterior to the point where the second canal branches out. In paired radii this stands dorsal to, and in the midventral radius to the right of, the respective radial canal. The fourth, which is the smallest of the four branches, is given off a very short distance from the third branch on the opposite side. This supplies the smallest tentacles forming the inner circle (V_2 and L_2). The third and the fourth branches run forwards, each with the ventilative apparatus in its course, over the incisions in the anterior margin of

radial segments. Exceptionally there seems to exist cases in which the branches are given off in a way different from that described above, and that especially with regard to the first and the second branches.

ii. *Phyllophorus japonicus* (v. MARENZELLER), *Ph. fragilis*, sp. n., and *Orcula hypsipyrge* v. MARENZELLER.

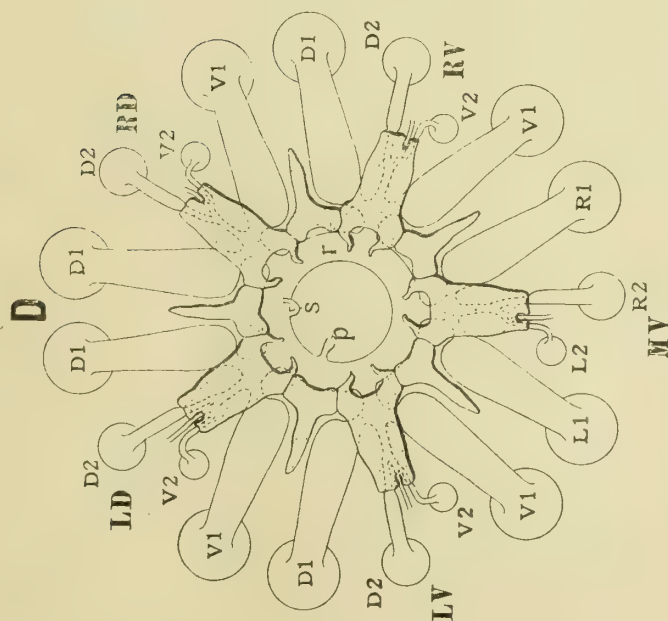
All these three species have twenty tentacles, which agree well with same of *Pseudocucumis africanus* in size and arrangement. In them, as in *Ps. mixta*, the radial segments of calcareous ring show on the axial surface slight depressions corresponding to the course of tentacular canals. The branching of these canals takes place in closely similar way as in *Ps. africanus*, so that a detailed description seems unnecessary. Only it may be noted that in *Ph. japonicus* the anterior margin of each radial calcareous segment is divided into two halves which are subequal or slightly unequal in breadth (textfig. 5, a).

iii. *Pseudocucumis japonicus* (BELL).

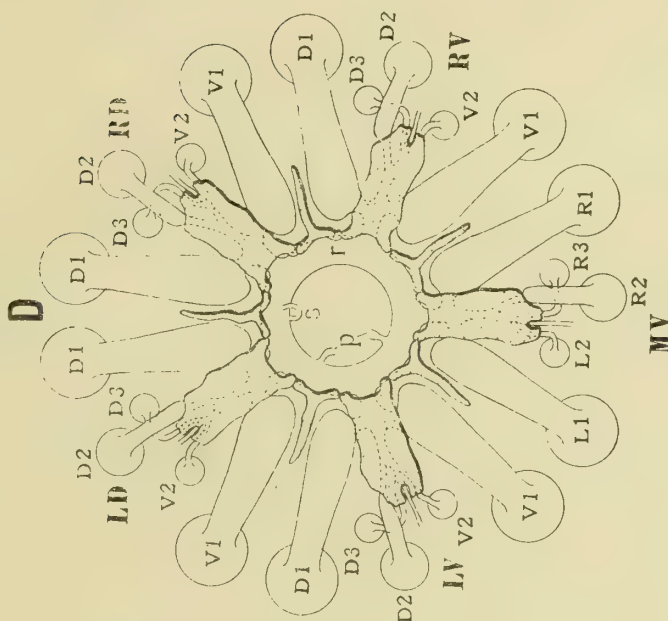
Of this species BEDFORD [4, p. 844, figs. II, A—B] has given diagrams showing size and arrangement of tentacles in the two original specimens. Should the blank spaces in his figure II, A——the one in the midventral and the other in the left ventral radius——be filled up each with a large tentacle, that figure will be made to greatly resemble the diagram I have given below (textfig. 2).

Of the several specimens of the species examined by me, all had twenty-five tentacles, except a single abnormal case with twenty-six of them. The large tentacles, ten in number, are disposed interradially in five pairs (textfig. 2, D_1 , V_1 , R_1 and L_1), with which alternate singly standing medium-sized tentacles numbering five in all (D_2 and R_2). The remaining ten small tentacles are arranged in five radially situated pairs (V_2 , D_3 , L_2 and R_3), forming an inner circle to that of the other fifteen. The only difference from the previous cases of species with twenty tentacles, lies in the addition of five small

Textfig. 1.



Textfig. 2.



Diagrams showing the canal system of tentacles and calcareous ring in *Pseudocnemis africana* (fig. 1) and *P. japonicus* (fig. 2). Calcareous ring (dotted) is cut open and arranged radially. One looks at the ring from behind anteriorly, so that the radial canals (outlined with broken lines) are hidden behind radial segments of calcareous ring. Tentacles represented in relative size and position. Ventilative apparatus in tentacular canals not represented. *D*, middorsal interradius; *LD*, left dorsal; *LV*, left ventral; *L1*, *L2*, midventral radii; *RV*, right dorsal; *RV*, right ventral; *R1*, *R2*, midventral radii; *p*, Folian vesicle; *s*, stone-canal.

tentacles (D_3 , R_3) to the inner circle, a new small tentacle appearing close to each of the five medium-sized ones, in paired radii dorsally to, and in the midventral radius to the right of, the old small tentacle (V_2 or L_2).

The anterior part of radial calcareous segments shows some features different from those of the preceding species. A deep indentation divides the anterior edge into two unequal or asymmetrical halves much as in *Ps. africanus* (textfig. 2). The two halves have obliquely slanting edge and each of them shows a slight notch. On the larger half, close to the deep median indentation, there is again another small notch (textfig. 3, a).

It can be plainly made out from sections that each tentacle is supplied with the five tentacular canals branching from the radial canal in an alternate arrangement. Aside from the presence of a fifth distalmost branch in each radius, the tentacular canals arise in a way similar to that in the twenty-tentacled species mentioned above. The small distalmost branch, which communicates with the fifth small tentacle, arises, in paired radii dorsally from, and in midventral radius to the right of, each radial canal. The smallest notch on the larger half of the divided margin of each radial calcareous segment stands in relation with the small distalmost tentacular canal just referred to (textfig. 2, D_3 and R_3).

2. *Observations on previous records regarding tentaculation.*

The size and arrangement of tentacles in *Pseudocucumis acicula* (SEMPER), *Ps. africanus*, *Ps. japonicus*, *Phyllophorus dearmatus* DENDY & HINDLE and *Ph. holothurioides* LUDWIG have been diagrammatically figured by previous authors, as LUDWIG [20, Taf. VI., Figg. 17, 23; 24, Taf. XV., Fig. 16; and 26, p. 96, Figg. 11. 12], BEDFORD [4, p. 844, figs. I—III], and DENDY & HINDLE [9, p. 104, fig. A]. But none of them have given an account of the

internal organization with reference to the arrangement of tentacles.

As to the relation between the notches of radial calcareous segments and tentacular canals, SEMPER [42, p. 67] has stated for his *Thyonidium cebuense* (= *Phyllophorus cebuensis*) as follows :—„Den Zwischenräumen zwischen den radialen und interradialen Gliedern entsprechen die grossen Tentakel, die kleineren stehen auf kleinen Einschnitten der radialen Glieder, welche einen 3. Ausschnitt für das Radiärgefäss und den Nerv zwischen sich fassen.“ More precise statements about the relations between tentacular arrangement, the canals and the anterior notches of radial calcareous segments are found in ÖSTERGREN's work [36, p. 4 with Fig. 1]. According to him, in *Pseudocucumis mixta*, the canals which join the two smaller tentacles in each radius, pass over slight notches on the two unequal processes of the radial segment. Though no mention is made as to the mode of branching of the four tentacular canals, it can be clearly seen from his figure that each radial canal gives off four tentacular canals in a regularly alternate manner on both sides, and that the smallest branch is given off last and goes over the narrower process of radial segments. Further, the same author has tried to show from LUDWIG's figure of the calcareous ring of *Orcula tenera* [26, Taf. VI., Fig. 17]* that the five small tentacles, which we see in twenty-tentacled forms, are there totally absent, and that the narrower half of the radial segment is pointed at the anterior end, instead of being notched. The third tentacular canal which stands in connection with each of the five small tentacles, is given off from the radial canal dorsally in paired radii, and to the right in the midventral radius. If we carefully look into the numerous figures given by various authors of the calcareous ring of polychirotous Cucumarids, it will be found that the statements of ÖSTERGREN for *Pseudocucumis* and *Orcula* with regard to the relation between the

* See also LUDWIG 25, p. 813, and Taf. XXX., Fig. 20.

anterior notches and tentacular canals are equally applicable for some other species, as f. i. *Pseudocucumis acicula* [LUDWIG 20, Taf. VI., Fig. 17], *Phyllophorus cebuensis* [THÉEL 46, Pl. IX., fig. 4; LUDWIG 26, Taf. VI., Fig. 10], *Ph. frauenfeldi* LUDWIG [20, Taf. VI., Fig. 22], *Ph. holothurioides* [LUDWIG 20, Fig. 23], and *Ph. celer* KOEHLER et VANEY [17, Pl. I., fig. 24]. Judging from SLUITER's figure of the calcareous ring of his *Orcula purpureo-punctata* [44, Taf. VI., Fig. 15], which clearly shows the presence of three notches in each radial segment, it seems highly probable that in that form there exist twenty tentacles, of which five were probably overlooked on account of their very small size. Also LUDWIG's statement [25, p. 814] that the anterior part of the calcareous ring of his *Phyllophorus brocki* is exactly similar in form to that in *Orcula tenera*, leaves room for suspecting if he has not overlooked a small notch at top of the narrower process of radial segment.

Here it may be stated that in the Molpadiidæ the fifteen tentacles present are usually given off in the same manner as in *Orcula*. LUDWIG [28, p. 590] has stated in his work on *Ankyroderma musculus* (RISSO) that the branching of tentacular canals stands in intimate relation to the form of calcareous ring. Each radial canal should give off three tentacular canals in an alternate manner, and in paired radii the first and the third are always dorsally directed. The midventral radial canal should usually send out the first and the third tentacular canal to the right, but occasionally to the left. GEROULD [14, pp. 161—162] came to the same conclusion from his examination of *Caudina arenata* (GOULD). LUDWIG [26, pp. 87—88] and ÖSTERGREN [36, p. 4 and 37, p. 208] took the above branching mode as valid in all the forms of the family. CLARK [8, p. 137] has stated that "there are not three (tentacles) in each interradius, as might be supposed, but four in the middorsal interradius, three in each of the latero-dorsal interradii, three in one of the ventral interradii, and two in the other."

EDWARDS' statement concerning *Holothuria floridana* POURTALES [11, p. 251] seems to be suggestive of the fact that in twenty-tentacled Holothurids a supernumerary and the last acquired tentacle stands usually dorsal to the radial canal: thus, he says: "In the 7 cases with more than the normal 20 tentacles there appears a slight tendency to the addition of extra tentacles dorsally."

3. *General consideration regarding the multiplication of tentacles.*

On the basis of the data given above, it seems not unwarranted to conclude that the multiplication of tentacles takes place, at least in the group of the polychirotous Cucumarids, according to a general plan, as follows:—

All the tentacular canals spring from the radial canal separately and alternately on both sides. In paired radii the first or the proximalmost tentacular canal branches out from the radial canal on the dorsal side; the second stands opposite to the first, *i. e.* on the ventral side; the third is again on the same side as the first, and so on. In the midventral radius the canals usually branch out in a way congruent with those in radii of the right side, *i. e.* the first, the third, *etc.* are on the right, while the second, the fourth, *etc.* are on the left side. The more distal the branching point, the smaller is the diameter of the canal and the size of the tentacle it belongs to, and the nearer is the position of the tentacle to the median line of radius.

For the sake of convenience, the tentacles to which the first and second tentacular canals belong, may be called tentacles of the first order, and those in relation with the third and fourth canals, tentacles of the second order, and so on. Thus, when a certain Cucumarid is said to have tentacles of the first and second orders only, it denotes that there exist either fifteen or twenty tentacles in that form. The so-called "decachirotous" forms, such as *Cucumaria* and *Thyone*,

have tentacles of the first order only; the first and second tentacular canals on each radial canal branching out exactly opposite to each other.

Here I may add a remark with regard to *Pseudocucumis intercedens* LAMPERT, the only species with thirty tentacles among the Dendrochirotes. According to LUDWIG [23, p. 26], twenty of the tentacles are larger than the remaining ten, which form an inner circle and stand in pairs, the pairs recurring regularly at intervals of every four large tentacles. I am strongly inclined to think that the above enunciation is applicable to this case also. I assume that here each radial canal gives rise to six tentacular canals, *i. e.*, one in addition to the five tentacular canals to each radial canal of twenty-five-tentacled forms such as *Ps. japonicus* (textfig. 2). That additional tentacular canal is probably the distalmost or the sixth branch arising from radial canal next after, and on the opposite of, the fifth. Should this be the case, it might be expected that there exists, in each radial calcareous segment [23, Taf. I., Fig. 2], a small notch on each of the two processes forming between themselves the deep median indentation.

4. Order of appearance of tentacles in ontogeny.

LUDWIG [30] appears to be the only author who has given any attention to the development of tentacles in polychirotous Cucumarids. For *Phyllophorus urna* GRUBE, he briefly stated that, so far as the first seven tentacles are concerned, the order of their appearance is similar to that he had observed in *Cucumaria planci* [27, pp. 183—184].* In the latter species he discovered that „die beiden Fühler der beiden ventralen Interradien ihre Wasserkanäle vom mittleren ventralen Radialkanal erhalten, während der Fühler des mittleren dorsalen, sowie derjenige des linken dorsalen Interradius

* See also diagrams given by BECHER 2, Taf. XXXVI., Fig. 43 or 3, p. 407, Fig. 1, a.

vom linken dorsalen Radialkanal und endlich der Fühler des rechten dorsalen Interradius vom rechten dorsalen Radialkanal versorgt werden.“*....., Der sechste und siebente“ continues the author, „liegen in Bezug auf die Medianebene der Holothurie einander genau gegenüber und erhalten ihre Wasserkanäle von denjenigen beiden Radialkanälen, welche sich bis dahin an der Abgabe von Fühlerkanälen überhaupt noch nicht beteiligt hatten, nämlich von dem linken ventralen und dem rechten ventralen.“....., Beide Radialkanäle entsenden den neuen Fühlerkanal in dorsaler Richtung, also in den linken, bez. rechten dorsalen Interradius.“ The pairs of primary tentacles, given off from the left dorsal and the midventral radial canal, are each made up of exactly opposite and equal-sized tentacles; therefore it can not be determined whether these appeared simultaneously or not, and if the latter be the case, which appeared first. At any rate, from the fact that the right dorsal radial canal gives off the first tentacular canal *ventrally*, it may be inferred that the order of appearance of tentacular canals does not correspond with their manner of branching in the adult.

Of great interest is EDWARDS' observation [12, pp. 216—220] on *Holothuria floridana* that, in each radius, the tentacle which corresponds to the first in polychirotous forms invariably appears first, while that corresponding to the fourth appears last. Moreover, the order of appearance of the four tentacular canals from the midventral radial canal is exactly in agreement with the branching order seen in *Pseudocucumis africanus*.

5. Systematic value of tentaculation in the Cucumariidæ.

The characters made use of for distinguishing genera and species

* Strangely enough a quite contradictory statement was made by the same author at another place, to the effect that the right dorsal radial canal gives off a tentacular canal „nur an seiner dorsalen Seite“ [27, p. 608].

of the Cucumariidæ have hitherto been principally the number, size and arrangement of tentacles, the distribution of pedicels and papillæ, and the structure of calcareous deposits in the perisome as well as of the calcareous ring. The presence or absence of the posterior prolongations in radial calcareous segments seems to be scarcely of more than specific import, though their presence in association with the prolonged "main canals" seems to be very frequent in the sporadipodous forms, such as *Thyone* and *Phyllophorus*. I should think the construction plan of calcareous deposits in perisome may be of use for the distinction of genera or subgenera; however, we have as yet, as ÖSTERGREN has said [37, p. 212], no sufficient data in that regard to avail of. That the anterior notches in the radial calcareous segments are in close relation with the number, size and arrangement of tentacles, was first pointed out to be of importance in classification by ÖSTERGREN [36, p. 5].

As a result of my studies I have come to see that, at least within the subfamily Phyllophorinæ, the ordinal rank of the tentacles present—not a mere statement of their number—taken in conjunction with the anterior notches in the radial calcareous segments, is of greater importance than the distribution of pedicels and papillæ in distinguishing genera.

The distribution of pedicels and papillæ often varies very much according to individuals or to age in one and the same species. Both the genera *Semperia* LAMPERT and *Ocnus* FORBES present in that respect no distinct demarcation against the genus *Cucumaria*, and therefore must be included in the latter [LUDWIG, 26, p. 345]. HÉROUARD [16, p. 9] has shown that young *Cucumaria mendax* THÉEL has five rows of pedicels, as is said to be characteristic of *Ocnus*, but older [individuals of that species resemble *Semperia* in that they possess additional pedicels scattered in a few number on interambulacra. A similar fact is also seen in *C. vegæ* THÉEL [46, p. 114]. According to LAMPERT [19, p. 61], *Orcula cucumiformis*

SEMPER has interambulacra either provided with pedicels in scattered distribution or totally devoid of these.

On the other hand, there are reasons to think that the number and arrangement of tentacles are something which is more constant than the distribution of pedicels and papillæ. The fact that, except in the Synaptidæ, the tentacles attain their full complement of number relatively early in the postembryonal development, is known from several cases of Holothurians, but unfortunately not from any polychirotous form.

All previous records of Cucumarid species said to possess tentacles in a number other than multiples of five, excepting the eight-tentacled *Sphærothuria bitentaculata* LUDWIG [29, pp. 148—149], are presumably based either on specimens which had accidentally lost some of their tentacles or on otherwise insufficient observations. It seems only fair to assume that except in abnormal individuals there can be no really congenital deviation of tentacle number from a multiple of five.

The two specimens of *Pseudocucumis japonicus* which were given by BELL [5, p. 253] to possess twenty-four tentacles, when later re-examined by BEDFORD [4, p. 845] were found to possess twenty-five and twenty-three tentacles respectively. MITSUKURI ascribed seventeen tentacles to a specimen of *Phyllophorus japonicus* [32], and fifteen to *Ph. fragilis* (see p. 82), but the specimens, as re-examined by me, were found to have in reality twenty tentacles each. While LAMPERT [18, p. 255] has described his *Pseudocucumis intercedens* to possess only eighteen tentacles, LUDWIG [23, p. 26] identified with it thirty-tentacled specimens.

Among the numerous specimens of *Pseudocucumis* examined by me, some were found to have a tentacle more and others with a few less than the normal number. The cases seem to deserve to be noticed here in short. One individual of *Pseudocucumis africanus* was provided with twenty-one tentacles, and another of *Ps. japonicus*

with twenty-six,—both therefore with an extra tentacle. They were laid out into sections and examined. In the former, the extra tentacle was found to belong to the category of the small ones and was situated in the left ventral radius. That tentacle communicated with a small canal which branched off dorsally from the fourth tentacular canal, and not directly from the radial canal. The latter specimen had the large extra tentacle in the right ventral interradius. Though I was unable, on account of unsuccessful sectioning, to clearly make out the origin of the tentacle in question, it seemed to belong to a canal branch given off ventrally either from the second tentacular canal or directly from the right ventral radial canal. In the two cases referred to, it is to be mentioned that the radial canal in relation to the extra tentacle did not branch in the regular normal manner, so that, f. i., the small extra tentacle of *Ps. africanus* does not correspond to the normal fifth tentacle (textfig. 2, D₃) of *Ps. japonicus*. It is not to be wondered at if there should occur in the polychirotous group an abnormal form provided with supernumerary tentacles, the cause of which fact might be referred to the occurrence of six ambulacra as in the cases of *Cucumaria planci* [LUDWIG 22, p. 473] and *Ludwigia ocnoides* (DENDY) [REIFFEN, 40, pp. 615—716]. A case in which the tentacles were evidently naturally deficient in number (not as the result of mechanical loss) was presented by a small individual of *Pseudocucumis africanus*, measuring 15 mm. in length. It possessed only sixteen tentacles instead of twenty, the deficiency being due to absence of a radius, or more properly speaking, to the fact that the midventral radial canal was fused with the left ventral into a common canal up to the point where the second tentacular canal was given off. The existing radii, abnormally quadriradial in disposition, had each four tentacles as in normal cases.

A great objection against relying upon the number of tentacles in classification lies in the fact that the state of preservation of the

specimens often prevents accurate counting. Much more useful in the systematic seems to be the distribution of pedicels and papillæ, and above all, I should lay great emphasis upon the ordinal rank of the tentacular canals, which may be said to be fairly constant.

6. *The system of Phyllophorinæ.*

SEMPER's classification of Dendrochirotæ into three subfamilies, Stichopoda, Gastropoda and Sporadipoda, based on the distribution of pedicels [42, pp. 47, 61 and 64], as well as BELL's [5, p. 254] and LAMPERT's [18, p. 114] proposal to divide the group into Decachirotæ and Polychirotæ according to the number of tentacles, were both rejected by LUDWIG [26, p. 321 and 323] as being in no harmony with the natural relationship of the genera.

ÖSTERGREN in his recent paper [37, p. 212] has offered a new view on the system of Holothurioidea, establishing under the family Cucumariidæ the three subfamilies, Cucumariinæ, Phyllophorinæ and Psolinæ. These three subfamilies are practically synonymous with Decachirotæ, Polychirotæ and Gastropoda respectively. Nevertheless, ÖSTERGREN's above view seems to me to be acceptable, since, firstly, it is desirable to derive family or subfamily name from the type genus; secondly, since the polychirote-gastropodous form *Théelia* LUDWIG can not find its proper position in any of the old subfamilies, and thirdly, since the Cucumariinæ and Phyllophorinæ differ from each other not only in tentacle number but also in other anatomical features.

Tabulating the various forms of the Phyllophorinæ with respect to the arrangement of ambulacral appendages, we have the following:—

Distribution of pedicels and papillae. Arrangement of tentacles & their number.		Pedicels arranged in distinct rows in ambulacra.		Pedicels distributed in both ambulacra and interambulacra, scarcely or not at all showing zonal arrangement.
		Interambulacra devoid of pedicels.	Interambulacra with a few papillae or pedicels.	
In 2 orders.	15	<i>Orcula discrepans</i> .	<i>Orcula cucumiformis</i> .	<i>Orcula</i> (most species).
	20	<i>Pseudocucumis</i> (most species).	<i>Actinocucumis</i> .	<i>Phyllophorus</i> .
In 3 orders.	25	<i>Pseudocucumis japonicus</i> .		
	30	<i>Pseudocucumis intercedens</i> .		

It is obvious that the system of the Phyllophorinae as it now stands is in much confusion. The genus *Orcula* includes all the fifteen-tentacled forms and even the stichopodous species *O. discrepans* SLUITER, while *Pseudocucumis* includes forms in which the tentacles number 18—30, and in which the zonal arrangement of pedicels is much pronounced.

I agree with ÖSTERGREN [33, p. 103; 34, p. 9; 35; p. 659 and 36, p. 23] in uniting *Orcula* with *Phyllophorus*. As reasons thereof I may adduce, firstly, the fact that the presence of a fourth tentacle in each radius of any twenty-tentacled form is often difficult to make out and is thus liable to be overlooked; and secondly the fact that tentacles number fifteen or twenty can not be made a definite criterion for separating the two genera, since the third and fourth tentacles may easily be taken for a pair belonging to the second order. The same may be said for the genus *Pseudocucumis* which should include the stichopodous forms with 15—20 tentacles. I see no reason for assuming generic difference between *Orcula discrepans* [SLUITER 44, p. 110] and *Pseudocucumis quinquangularis* SLUITER [44, p. 108], the former said to have fifteen tentacles and the latter eighteen. Further, the species *O. cucumiformis* should also be referred to

- disappeared.....*Ph. japonicus*.
dd. In the introvert rosettes only ; in general perisome tables with
 spire consisting of four or more pillars.
c. Tables very thinly scattered on body surface, so that the
 skin is soft to the touch ; spire of tables rudimentary
 *Ph. fragilis*.
cc. Tables profusely present on body surface, rendering the skin
 rough to the touch ; spire of table very tall....*Ph. hypsipyrigus*.

Genus *Amphicyclus* BELL.

Amphicyclus BELL, 1884 [5], p, 254.

Type.—*A. japonicus* BELL.

The generic diagnosis given by BELL is as follows :—

“Stichopod arrangement of the suckers associated with the possession of more than ten oral tentacles ; the tentacles in two circles ; those of the inner are arranged in pairs, are ten in number, radial in position, smaller than those of the outer circle, in which there are fourteen subequal tentacles. There are no calcareous pharyngeal plates, and two of the retractors of the pharynx are united with one another.”

Now, if my identification of the specimens on hand with *A. japonicus* be right, I should propose to define the genus as following :—

Tentacles of unequal size 25—30 in number, present in three orders. Small tentacles in five pairs, which are radial in position and regularly alternate with pair of larger ones, form the inner circle. Pedicels limited to ambulacra, interambulacra being naked. Radial segments of calcareous ring without posterior prolongations. Calcareous deposits of general perisome in the form of tables with spire consisting of two pillars.

Except in tentacle number, this genus closely approaches *Pseudocumis*. Two species belong to the genus, namely *A. japonicus*

BELL and *A. intercedens* (LAMPERT).

1. *Amphicyclus japonicus* BELL.

(Pl. I., figs. 5-6; textfigs. 2-3).

Amphicyclus japonicus BELL, 1884 [5], pp. 253-254.—LAMPERT, 1885 [18], p. 181—THÉEL, 1886 [46], p. 126.

Pseudocucumis japonicus LUDWIG, 1887 [24], p. 1239.—AUGUSTIN, 1908 [1], p. 29.

Pseudocucumis japonica LUDWIG, 1889-'92 [26], p. 348.—BEDFORD, 1899 [4], pp. 844-845.

Habitat.—Tsugaru Strait. Lat. $41^{\circ} 12' N.$, long. $140^{\circ} 45' E.$, 43 fms., sand and mud: 2 specimens (BELL).

Uraga Channel. Lat. $35^{\circ} 13' N.$, long. $139^{\circ} 44' E.$ (AUGUSTIN).

Numa, Sagami Sea (Matsuwa-lighthouse-line, Mera out or not quite out), 260 fms.: a single specimen (K. MITSUKURI & K. AOKI coll., Aug. 22, 1903. Sci. Coll., Spec. No. 1739).

Northern part of Suruga Bay, 275 fms.: a single specimen (K. AOKI coll., June 1, 1905. Sci. Coll., Spec. No. 1743).

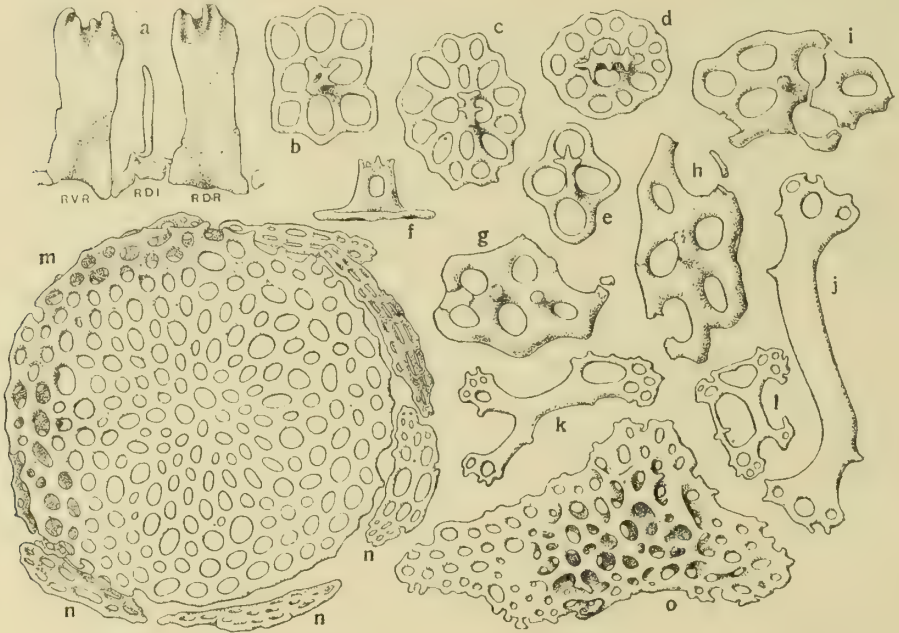
Tōkyō market, probably from the Province of Echizen: 4 specimens (S. TANAKA don., Feb. 15, 1911. Sci. Coll., Spec. No. 1738).

Size and form.—The single specimen from Sagami Sea (Pl. I., fig. 5) is in fully extended state. Body slender, gradually tapering at both ends. Length 51 mm. exclusive of tentacles; diameter of the thickest part 7 mm. The Suruga Bay specimen is also well extended: length 45 mm.; maximum diameter 11 mm. The remaining four specimens are much contracted, though some of them have the introvert protruded (Pl. I., fig. 6): body cylindrical, bluntly ending at both extremities, the largest measuring 48 mm. long and 11 mm. thick.

Color.—General perisome light brown to deep greyish brown; very lightly colored in distended parts. Pedicels of a light brown, whitish at tip. Introvert and tentacles pure white.

Integument.—Finely wrinkled all over, except on introvert which is quite smooth; thick and muscular in contracted specimens, but very thin and leathery in extended ones.

Tentacles.—Twenty-five in number, present in three different sizes (textfig. 2). As measured in a small but fully extended specimen, the largest ten tentacles situated pairwise in each inter-radius attain a length of 5 mm. The five medium-sized tentacles, radial in position, are 3 mm. long. The smallest ten tentacles, occurring in a pair in each radius, are only 1 mm. long; they form an inner circle to that of the others.



Textfig. 3.

Amphicyclus japonicus BELL. *a* Three consecutive segments of calcarous ring viewed from axial side. *b-e* Tables from introvert seen from above; *f* same seen from side. *g-i* Imperfect tables from general perisome. *j* Supporting rod of tentacle. *k-l* branched rods from tip of tentacle. *m* End-plate of pedicel; *n* curved perforated plates surrounding the end-plate. *o* anal tooth. (*a* $\times 6$, *b-l* $\times 300$, *m-o* $\times 150$).

Pedicels.—Pedicels seem to be but little retractile and measure 2.5—3 mm. in length. They form a zigzag row in each ambulacrum, though in contracted specimens they are often seen in a double or quadruple row. Near ends of body they are arranged in a single row in each ambulacrum. Interambulacra are naked.

Calcareous deposits.—Tables are always found in the introvert (textfig. 3, b—f). The disk is usually oval with entire or sometimes wavy margin (c—d); its longer diameter 0.045—0.07 mm., and the shorter 0.03—0.06 mm. Holes 4—16 in number, usually regularly distributed; of the four larger holes, which are separated from one another by the primary cross, one pair is larger than the other. Spire 0.025—0.03 mm. high, consisting of two pillars united at top to form a crown armed with 4—8 teeth (f). Only in the specimen from Sagami Sea, which appears to be the youngest of all I have had, some calcareous deposits are found very sparsely in the general perisome. These are imperfect in form, being fragmentary or partly dissolved; the more perfect forms I have found are shown in text-figure 3, g—i. The deposits may be said to be of the form of a table with two rudimentary pillars and with four central and some peripheral holes. The largest measured was 0.105 mm. long and 0.055 mm. broad. Around the anus there exist five anal teeth (o), each irregularly triangular in form and lying with the obtuse tip directed posteriorly. They attain 0.35 mm. in length and 0.22 mm. in breadth. Besides them, there are found in their proximity some scattered X-shaped rods similar to those of tentacles, together with imperfectly shaped end-plates. In pedicels a single end-plate and a small number of supporting buttons are found. The end-plate (m) is well developed, its diameter varying within range of 0.25—0.4 mm. The supporting buttons or curved plates (n) are found only in the vicinity of the end-plate. They are up to 0.14 mm. long and about 0.05 mm. broad, and are curved in adaptation to the curvature of the wall of pedicel; they are pierced by holes in two or

three rows. The tentacles are supported by rods and X-shaped bodies of various sizes. The rods (j) are usually recurved, 0.08—0.2 mm. long, and are supplied at both ends with a few holes. At tip of the branches of tentacles there are various forms of X-shaped bodies (k—l), which can be derived from the above mentioned rods. Their length measures 0.06—0.1 mm.

Calcareous ring.—Weakly calcified and imbedded in the connective tissue, so that in young individuals it is liable to be overlooked. In large individuals, however, they can be readily found and examined. Radial segment (a, RVR and RDR) 4.5 mm. long, 1.6 mm. broad, and without posterior prolongations; on its anterior margin are found four notches, one for radial canal and the remaining three for tentacular canals. Interradial segment (a, RDI) slender, of the form of inverted Y, measuring 3 mm. in length and 1.5 mm. in breadth.

Musculature.—The retractors are inserted to radial muscles at different points of body length: the retractor of midventral radius is inserted most anteriorly, while those belonging to dorsal radii are inserted most posteriorly. As measured in a specimen 51 mm. long, the retractor of the midventral radius has its insertion at a point 24 mm. distant from the posterior body end, *i. e.*, at about the middle of the body; retractors of ventral lateral radii at a point 21 mm. *i. e.*, about two-fifths the body-length, from same; and those of dorsal radii at 18 mm. *i. e.*, about one-third the length, from same. In contracted specimens both circular and radial muscles are quite thick.

Polian vesicle.—Usually single, situated in the left dorsal interradius. Its length varies from 5 to 11 mm. Very often there is found an accessory vesicle of 7—11 mm. length in the left ventral interradius.

Stone-canal.—Situated on the right side of dorsal mesentery, ending with a kidney-shaped madreporite similar to that found in *Cucumaria calcegera* (STIMPSON) and first described by EDWARDS [10, p. 57]. In length it reaches 2—2.5 mm., including the

madreporite which is 1—1.5 mm. in diameter.

Digestive tube.—Variable in calibre as well as in length. About 15 mm. behind the calcareous ring, the tube enlarges itself to form a stomach of about 2 mm. diameter. The third limb of the intestine is suspended by a mesentery attached to the left of midventral radial muscle. The entire digestive tube is 72 mm. long in a specimen of 51 mm. length; while in a contracted individual 48 mm. long, it measured as much as 190 mm. in length.

Respiratory trees.—Two in number, each running along dorsal lateral interradius; their length may reach to three-fourths that of extended body.

Genital tubes.—In two tufts, the tubes branching once or twice near base. Genital papilla could not be made out.

Remarks.—As regards the size and color of this species BELL has given no statement. The identification of the above described specimens with the species of BELL seems to be justified by the following facts: 1) the presence of twenty-five tentacles is a feature unique in the Cucumariidæ; 2) the localities of both BELL's and AUGUSTIN's specimens either agree with those of mine or stand with these under the influence of the same current; 3) "the complete absence of rods or spicules from the walls of body or tube-feet" in my specimens excepting the youngest individual observed by me; 4) the presence of "terminal plates of the tube-feet, and the delicate and elegant bars which are found in the tentacles"; and 5) the weak development of calcareous ring, of which BELL found no sign but was supposed by LUDWIG [26, p. 83] to be present in an imperfect condition.

As to the two retractors approaching and uniting with each other as given by BELL, I should say with LUDWIG [24, p. 1239] that such an occurrence may be met with in individual cases but does not seem to constitute a constant character of diagnostic value. Besides from v. MARENZELLER's observation [31, p. 135], I can give

a number of such abnormal retractors from my own observations in some other polychirotous forms. The attenuation of the hinder end and the thick integument of the anterior body end in BELL's specimens are, I suppose, merely due to the state in which the specimens were killed. Genital tubes filling the greater part of body-cavity in a large number can scarcely be taken for a matter of specific importance as BELL has considered it to be. In my specimens the number of tubes and their thickness vary very much according to sex as well as to the season of capture.

After all I have said, the diagnosis of the present species may be emended as follows :—

Body cylindrical, truncate or tapering at both ends. Body length may exceed 50 mm. General perisome greyish brown, tip of pedicels light brown, tentacles and introvert white. Tentacles twenty-five in number, in three different sizes; the largest ten standing in five pairs which alternate with the medium-sized five, these being radially situated. The small ten tentacles arranged pairwise on each radius, forming inner circle of tentacles. Pedicels limited to ambulacra, arranged in a zigzag row or in 2—4 rows. Integument soft, usually without any calcareous deposit. Tables with spire made up of two pillars are found in the introvert. End-plate of pedicels as well as anal teeth present. Tentacles supported by recurved or branching rods. Calcareous ring weakly calcified; radial segment with four unequal anterior notches, but without posterior prolongations; interradii slender, of the form of inverted Y. Polian vesicle usually single, hanging in the left dorsal interradius, but often with an accessory vesicle in the left ventral interradius. Stone-canal provided with reniform madreporite. Genital tubes once or twice branched, in two tufts.

Genus *Pseudocucumis* LUDWIG.

Pseudocucumis LUDWIG, 1874 [20], p. 14.—1886 [23], p. 27. —1887 [24], p. 1241.

Type.—*P. acicula* (SEMPER).

LUDWIG at first limited the tentacle number of the genus to twenty; later he made the genus to comprehend forms with from eighteen to thirty tentacles, and finally those which have more than fifteen tentacles of unequal size.

On the basis of my view on the system of Phyllophorinæ, I propose to change the generic diagnosis with regard to the number of tentacles and the distribution of pedicels. Since in my opinion *Orcula discrepans* and *O. cucumiformis* should be referred to *Pseudocucumis*, while *P. japonicus* as well as *P. intercedens* should be removed from it, the genus may be defined as follows:—

Tentacles in two orders: 15—20 in number, unequal in size. The smaller tentacles stand as a rule alternately with the larger ones, all or a part of the former forming an inner circle of tentacles. Pedicels limited to ambulacra, but sometimes scattered in a few number on interambulacra also.

2. *Pseudocucumis africanus* (SEMPER).

(Pl. I., fig. 4; textfigs. 1 and 4).

Cucumaria africana SEMPER, 1868 [42], p. 53.

Cucumaria assimilis BELL, 1886 [6], p. 27.

Pseudocucumis theeli LUDWIG, 1887 [24], p. 1236.

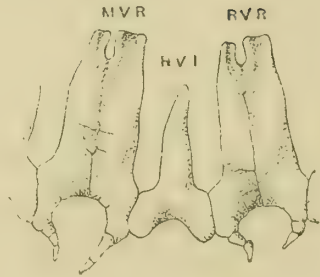
Pseudocucumis africana LUDWIG, 1888 [25], p. 815.—MITSUKURI, MS. [32].

Besides the numerous specimens from Kyūshū and Riū-Kiū Islands, which were studied by the late Professor MITSUKURI, I have two specimens from Takanoshima in the Bay of Tateyama in Province Awa, lat. 34° 59' N., long. 139° 51' E. (Sci. Coll., Spec. No. 1737). This is the northernmost locality known for the species. They were collected by Mr. K. KAWAGUCHI on July 30, 1910.

The two specimens measure in length respectively 32 mm. and 25 mm., both with the introvert in well extended state (Pl. I., fig. 4).

The color is a deep brownish purple all over, somewhat lighter on ventrum than on dorsum. All the viscera are of a uniform purple color, probably due to staining after preservation. As to calcareous deposits of the perisome, it may be worth while to note that in the introvert I have found only the rods described and figured by LUDWIG [24, p. 1238 and Taf. XV., Fig. 15], the lenticular plates characteristic of the species being there totally absent. As to other characters of the species, except as regards the asymmetry of

the calcareous ring (textfig. 4) and the arrangement of tentacles (textfig. 1) before enunciated, I have nothing to add to the descriptions given by previous observers.



Textfig. 4.

Three consecutive segments of the calcareous ring of *Pseudocucumis africanus*, viewed from the axial side. ($\times 10$).

Genus *Phyllophorus* GRUBE (LUDWIG emend.)

(+ *Orcula* TROSCHER.).

LUDWIG [24, p. 1240—1241] last defined the genus to have unequal sized tentacles more than fifteen in number, of which the smaller stand alternately with the larger, all or a part of the former forming an inner circle of tentacles. ÖSTERGREN's suggestion to unite *Orcula* with the present genus seems to be reasonable, as I already mentioned at the end of Part I of this paper. Moreover, the genus should comprise a Hawaiian species recently described by FISHER [13, pp. 713—715] under the name of *Thyonidium alexandri*, in which ventral interambulacra are naked. Consequently, in my opinion, the genus should be defined as follows:—

Tentacles in two orders: 15—20 in number, unequal in size. The smaller tentacles stand as a rule alternately with the larger ones, sometimes (in forms with 20 tentacles) forming an inner circle. Pedicels scattered all over body, seldom showing zonal arrangement on ambulacra; some interambulacra may be naked.

3. *Phyllophorus limaconotus* (BRANDT).

Cladolabes limaconotos BRANDT, 1835 [7], pp. 57—58.

Holothuria limaconotus SELENKA, 1867 [41], p. 331.

Orcula limaconotus LUDWIG, 1881 [21], p. 589.—LAMPERT, 1885 [18], p. 169.—THÉEL, 1886 [46], p. 149.—LUDWIG, 1889—'92 [26], p. 347.

Only a single specimen of this species is known from the Bonin or Ogasawara Islands, and that very imperfectly. While in the original description of BRANDT the tentacles were stated to be twenty in number, LUDWIG [21] later found them in the same specimen to be only fifteen. From the bad state of preservation of the specimen, it can not be decided if the absence of any calcareous deposit from the perisome as well as from the pedicels can be taken as a real character of the species. It seems highly probable that this is not a good species, and had perhaps better be united with *Phyllophorus tener* (= *Orcula tenera* LUDWIG) or some other species of *Phyllophorus*.

4. *Phyllophorus japonicus* (v. MARENZELLER).

(Pl. I., fig. 2; textfig. 5).

Thyonidium japonicum v. MARENZELLER, 1881 [31], p. 134, Taf. V., Fig. 9.

Phyllophorus japonicus LUDWIG, 1889—'92 [26], p. 347, Taf. VI., Fig. 16.—MITSUKURI, MS. [32].

Habitat.—Japan: 2 specimens (v. MARENZELLER).

Haneda, Tōkyō Bay: a single specimen (MITSUKURI).

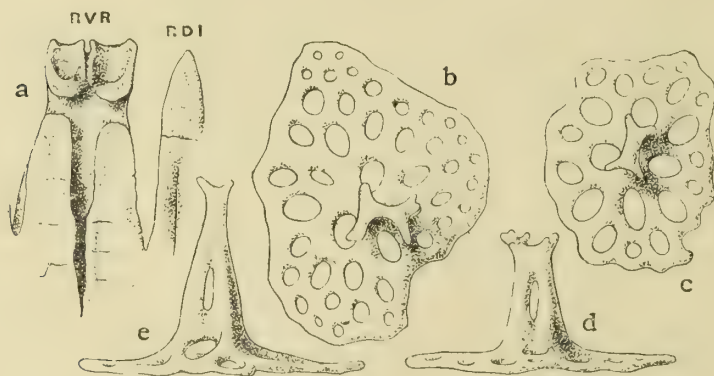
Off Tsurugizaki, Uraga Channel: a single specimen (MITSUKURI).

Sagami Bay (Takeyama over Kurozaki), 40 fms.: a single specimen (MITSUKURI).

Southern part of Ōsaka Bay, about 8 fms.: a single specimen (K. AOKI coll., Mar. 8, 1903. Sci. Coll., Spec. No. 1746).

I have examined the last named specimen, and I may here put down some points which differ from, or are not mentioned in, the descriptions given by v. MARENZELLER and MITSUKURI.

The specimen (Pl. I., fig. 5) is strongly contracted, being of a thick spindle-like shape. Length 71 mm., breadth 39 mm., and height 32 mm. The skin is thick and stiff, rough to the touch, and full of creases. Wart-like contracted pedicels white, creases of a reddish brown color. Of the twenty greyish black tentacles, ten are large and the rest small. In the introvert tables (textfig. 5, b—d) only are found. The disk is of an irregular shape, ranging in diameter 0.09—0.13 mm. but most commonly 0.10—0.12 mm. Holes number 12—15, sometimes even more than 40; spire consisting of



Textfig. 3.

Phyllophorus japonicus (v. MARENZELLER). *a* Anterior parts of the right ventral radial segment of the calcareous ring, with an adjoining interradiar segment, seen from axial side. *b—c* Tables from introvert, seen from above; *d* same seen from side. *e* Table from tentacle, seen from side. (*a* $\times 3$, *b—e* $\times 300$).

two pillars which unite with each other but once, forming four teeth at apex. Height of spire is usually about 0.05 mm., but may reach 0.08 mm. near and in the tentacles (c). In the general perisome the tables are incomplete, changing into irregular perforated plates of various shape as figured by v. MARENZELLER [Fig. 9, a]. Tentacles supported by somewhat irregular tables and perforated rods as well as by a few rosettes. Peculiarly modified tables of the form of a tripod, described by v. MARENZELLER and MITSUKURI as supporting pedicels, I could find only in the pedicels located in the anteriormost parts. End-plate of pedicels imperfect and small, consisting of irregularly branched rods; its diameter varying within a range of 0.14—0.15 mm.

Calcareous ring (a) is 40 mm. long, and is composed of numerous small pieces as is well known. Retractors inserted on body-wall at different points of radial muscles: those of dorsal radii inserted in the middle of the length of the contracted body, those of ventral lateral radii at a distance from the posterior end equal to about eight-thirteenths the length of the respective radial muscle, and the mid-ventral retractor at a distance from the posterior end of more than two-thirds the length of the arched midventral radial muscle.

A tubular Polian vesicle, 38 mm. long and 30 mm. in diameter, hangs on the circular canal in the left dorsal interradius. Stone-canal 7 mm. long, with an ellipsoidal madreporite about 1 mm. long. The third limb of intestine runs along the left side of the midventral radial muscle. The respiratory tree in each dorsal lateral interradius extends nearly throughout the entire body-length.

5. *Phyllophorus fragilis* MITSUKURI & OHSIIMA, sp. n.

(Pl. I., fig. 3; textfig. 6).

In his manuscript the late Professor K. MITSUKURI provisionally considered this species to be new and described it as follows:—

“Specimens examined.—12 specimens from Sakibaru near Naha,

Okinawa Island; collected by me on dead coral reef, Apr. 7, 1901 (No. 1657). 9 specimens from Nishino-omote, Tanegashima, Satsuma; S. IKEDA coll., Jan. 4, 1905 (No. 1658). 1 specimen from Satsukawa, Amami-Ōshima; MITSUKURI and YASUDA coll., Mar. 31, 1901 (No. 1659).

"Size.— 6.5×1.9 cm. (a large one in lot no. 1657); 2.8×1.4 cm., 3.1×1.7 cm., 2.25×1.3 cm. (small ones in lot no. 1657).

"Shape.—Spindle-shaped, tapering towards both ends.

"Color.—Uniformly brown in alcohol. In one specimen some large patches on the body. In life I have observed a purple tinge on the animal, but can not remember exactly how this was caused.

"Pedicels.—Scattered irregularly all over the body in ambulacra as well as in interambulacra. In most specimens they are more crowded on ventral than on dorsal surface. In some, longitudinal arrangement of pedicels is recognizable, especially towards the posterior end. The ventral ambulacra seem to possess three or four rows of pedicels each, leaving narrow interambulacral spaces free of pedicels.

"Tentacles.—Fifteen in number; in one specimen ten large and five small, in another eleven large and four small.

"Calcareous ring.—Both radialia and interradialia made up of numerous small pieces. Radialia anteriorly with three notches, posteriorly with two prolongations made up of eight or more small pieces joined together. Interradialia pointed anteriorly, each wedging itself between the posterior prolongations of two adjoining radialia, consisting of several small pieces. Hind ends of posterior radial prolongations continuous with corresponding ends of adjoining radialia.

"Retractor muscles thick, short, attached to body-wall at about $\frac{1}{4}$ the body length from the anterior end of body.

"Polian vesicle one. Stone-canal probably one.

"Calcareous deposits.—None in any part (the neck portion not excepted) of the body-wall of most specimens. In some (at least in one young specimen of 2.25×1.3 cm.) there are found tables in

sparsely scattered distribution. These have complete or incomplete disk. Complete disks show four central holes and eight large peripheral holes, their margin being tolerably smooth and slightly wavy. Incomplete disks are of all sorts. There may exist central holes only, or one or more of the peripheral holes may not be closed in. In none there is a complete spire, this being represented generally by four short knobs which do not unite at all. In one case, I thought to have seen one cross-piece, but I am not sure of it, as I could obtain the view from above only. In tentacles there are small rosettes. In pedicels of some specimens there exist incomplete rosettes in a greater or smaller number.

"This species is very common on dead coral reefs near Naha, Okinawa Island. It lives buried in coral sand. One great characteristic of it is that it throws out viscera with the least touch, making it very difficult to obtain specimens with the viscera intact. Mr. IKEDA observed the same fact and remarked: 'As soon as the stone under which these animals live are lifted up, they throw off the viscera, even before they are touched in any way.'

"I am much surprised that I can not identify these specimens with any of the known species. I can not think that SEMPER and others who have explored tropical or subtropical seas, did not obtain these animals, for I suppose the species extends further south than the Okinawa group. Not improbably it occurred among the collections previously studied, but has remained mixed up with some others in the present chaotic state of the species of the genera *Orcula*, *Phyllophorus*, *Thyonidium*, &c.

"I name this provisionally *Phyllophorus fragilis*. If the genus *Orcula* is to be retained, I suppose the species should be placed in that genus; but it seems to me that *Orcula* is only a special case of *Phyllophorus* and I am inclined to agree with ÖSTERGREN in merging it into *Phyllophorus* (ÖSTERGREN 1898, p. 103, footnote)."

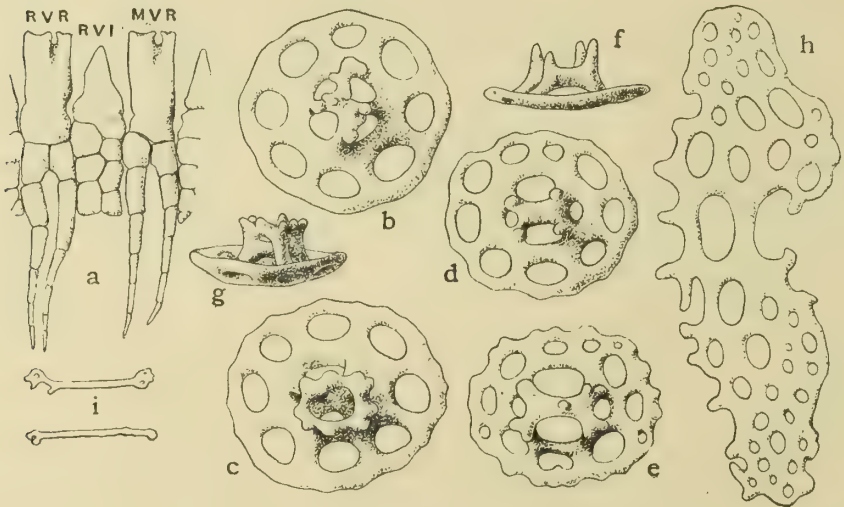
The results of my own observations on the specimens examined

by the late Professor MITSUKURI as well as on four more specimens collected by Dr. M. MIYAJIMA at Naha on May 25, 1900 (Sci. Coll., Spec. No. 1747), differ in some respects—above all in regard to the tentacle number and the calcareous deposits—from the above cited statements. They may be given as follows:—

Form and size.—All specimens are much contracted, eviscerated and have introvert drawn in. The least contracted of them is shown in Pl. I., fig. 3. This is of a somewhat cylindrical shape, but is strongly curved. Its length is 57 mm. along the middorsal line and 91 mm. along the midventral; greatest diameter 16 mm. In all other strongly contracted specimens the body is spindle-shaped.

Integument.—Muscular, quite soft to the touch.

Tentacles.—Invariably twenty in number. The largest ten tentacles 12—18 mm. long in the contracted state; the medium-sized five tentacles 5—8 mm. long; the smallest five tentacles radial



Textfig. 6.

Phyllophorus fragilis MITSUKURI & OHSHIMA, sp. n. *a* Three consecutive segments of the calcareous ring seen from abaxial side. *b-e* Various forms of tables from general perisome and pedicel, viewed from above; *f-g* same seen from side. *h* Perforated plate situated near the end-plate. *i* Supporting rods of tentacle. (*a* $\times 3$, *b-i* $\times 300$).

in position, only 2 mm. long and liable to be overlooked in the contracted state.

Calcareous deposits.—Except in introvert, tables are quite sparsely scattered in all parts including the wall of pedicels. Their disk (textfig. 6, b—c) is usually of a roundish outline with smooth or rarely serrated margin, the diameter varying within a range of 0.05—0.09 mm. They are more or less regularly perforated by a large central hole and eight or more peripheral holes. Over the central hole there is spanned a cross-shaped arch, from which arise four rudimentary pillars of 0.02 mm. height (f). The pillars but seldom branch on top and there form an incomplete toothed crown (c and g). Rosettes are profusely found in introvert and anal region, but in a very small number in tentacles and pedicels. They are oval in general outline, measuring 0.02—0.06 mm. in the longer diameter. End-plates are well developed, their diameter varying from 0.15 mm. to 0.4 mm. in accordance with the size of pedicels. Around the end-plate there are found a number of elongate perforated plates or supporting buttons without knob (h). At tip of tentacles there are found delicate supporting rods (i) in very thinly scattered distribution. They measure 0.04—0.09 mm. in length and are provided with one or two holes at both ends. Rudimentary anal teeth consisting of a loose calcareous network are present. Anal papillæ are supported by irregular perforated plates.

Calcareous ring.—Radial segment (a, RVR and MVR) 13—17 mm. long and 2 mm. broad, with the anterior margin divided into two unequal halves by a deep notch (a). Posterior prolongations composed of about six pieces. Interradial segments (RVI) 8—12 mm. long and 1.5—2 mm. broad, each composed of several pieces.

Retractor muscles.—Inserted at different levels, the midventral one most anteriorly. In the specimen represented in fig. 3, Pl. I., those of the dorsal pair are inserted to respective radial muscle at a distance of five-elevenths, those of the ventral pair at that of two-

sevenths, and the unpaired midventral at that of two-ninths the length of same from the anterior end. In another specimen the same distances were respectively two-fifths, a quarter and one-fifth the length of the radial muscle in relation.

Polian vesicle.—Usually single, situated in the left dorsal interradius, 5—10 mm. long. In one specimen two vesicles were found hanging together in the same interradius.

Stone-canal.—Situated on dorsal mesentery, 1.5—3 mm. long, provided with a minute madreporite.

Respiratory trees.—Two, each running along the whole length of dorsal lateral interradii.

Genital tubes.—In bundle on both sides of dorsal mesentery, about 7 mm. long, once or twice dichotomously dividing.

From the foregoing remarks, the present species may be diagnosed as follows:—

Body usually spindle shaped in contracted state; length up to 65 mm. Color of general perisome uniformly brown, or with purple patches. Tentacles twenty in number, of three different sizes: ten large, five medium-sized, and five small. Pedicels scattered all over body surface, somewhat more numerous on ventral than on dorsal surface; zonal arrangement sometimes recognizable. Integument soft, with very sparsely scattered tables showing a large central hole and eight or more smaller peripheral holes in the disk, and four low pillars which may sometimes unite with one another at top. Well developed end-plate and rudimentary anal teeth present. Introvert provided with rosettes only, similar deposits being also found in anal region and in a small number in pedicels and tentacles also. Tip of tentacles provided with delicate rods. Both radial and interradiial segments of calcareous ring consist of several small pieces. Radial segment with long posterior prolongations and three anterior notches. Polian vesicle single, situated in left dorsal interradius. Stone-canal small. Genital tubes in two tufts, once or twice branched.

Remarks.—This species comes very close to *Phyllophorus cebuensis* with regard to their color, habitat and calcareous tables. But in that species, as unanimously given by authors, interradianal segments of the calcareous ring are simple, while no other calcareous deposit than tables has been given to exist [SEMPER **42**, p. 67, Taf. XII., Fig. 5; Taf. XIII., Fig. 25; Taf. XV., Fig. 8; PEARSON **38**, pp. 194—195, Pl. II., figs. 22—24; **39**, p. 191]. The specimen described by THÉEL under the name of *Thyonidium cebuense* [**46**, p. 95, Pl. IX., fig. 4], which PEARSON [**38**] proposed to distinguish as var. *theeli*, is doubtlessly different from ours, in that it possesses much modified tables in pedicels. Our species also appears to be allied to *Phyllophorus tener* in having a sparse number of tables of similar size and form and in having calcareous ring of a similar structure. The two forms are, however, markedly different in the number of tentacles and in the presence of “Kalkconcretionen” [LUDWIG **20**, p. 19, Taf. VI., Fig. 21, b] instead of rosettes. As regards *Ph. tener*, the fact reported by SLUITER [**43**, p. 208] that that species lives quite a long time in aquarium, seems to indicate a point of its difference from *Ph. fragilis*, which, according to MITSUKURI's observation, is a very difficult animal to handle without causing evisceration.

6. *Phyllophorus hypsipyrus* (v. MARENZELLER).

(Pl. I., fig. 1; textfig. 7).

Orcula hypsipyrus v. MARENZELLER, 1881 [**31**], pp. 135—136, Taf. V., Fig. 10.—LAMPERT, 1885 [**18**], p. 168.—THÉEL, 1886 [**46**], pp. 97, 149, Pl. V., fig. 6, a-b.—LUDWIG, 1889—'92 [**26**], p. 347.—SLUITER, 1901 [**44**], p. 109.

Habitat.—Japan: a single specimen [v. MARENZELLER].

Akashi Strait, “Challenger” Station 233 A. Lat. 34° 38' N., long 135° 1' E., 50 fms., sand: a single specimen (THÉEL).

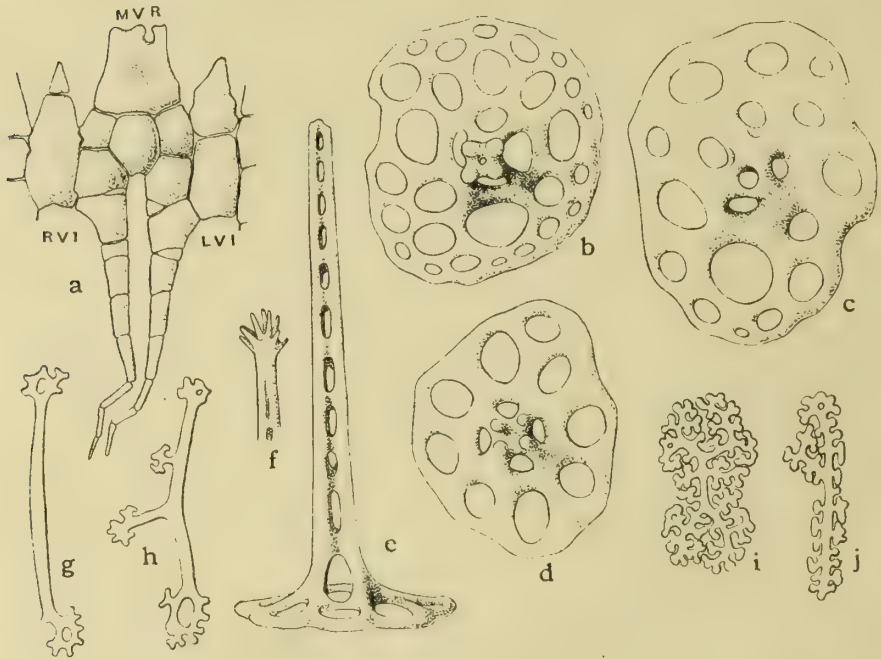
Molo-Strasse, “Siboga” Station 51, 69—91 m., sand with stones and shells: a single specimen (SLUITER).

Southern part of Ōsaka Bay, about 8 fms.: four specimens (K. AOKI coll., Mar. 8, 1903. Sci. Coll., Spec. Nos. 1744—1745).

Size and form.—A specimen, the least contracted, with tentacles partly visible from the outside, is represented in Pl. I., fig. 1. Body cylindrical, slightly curved, broadest in the posterior half; the anal part conically pointed. Length 95 mm., breadth 27 mm. The other three specimens are much contracted and of a spindle-like shape. Length 59, 66 and 70 mm. respectively.

Color.—Dirty grey; contracted parts dark; pedicels whitish.

Integument.—Of varying thickness according to the degree of



Textfig. 7.

Phyllopleurus hypsipyrus (v. MARENZELLER). *a* Midventral radial segment of the calcareous ring with adjoining interradial segments, abaxial view. *b-d* Tables from general perisome, viewed from above; *e* Same seen from side. *f* Tip of spire from side. *g-h* Supporting rods of tentacle. *i-j* Rosettes from introvert. (*a* $\times 3$, *b-j* $\times 300$).

contraction. Its surface rough to the touch, due to the presence of tall-spired tables.

Tentacles.—Twenty in number, of which ten are smaller than the rest.

Pedicels.—Papilla-like, contracted, distributed all over body surface in more or less conspicuous zonal arrangement.

Calcareous deposits.—In general perisome there are found tables only (textfig. 7, b-f). Disk usually of rounded outline with even margin; many-holed ones often elongate. Diameter of disk 0.08—0.17 mm., commonly about 0.12 mm. Holes number 8—36; most commonly 10—15 besides a large central one. Spire stands over the central hole and is very tall, measuring 0.10—0.20 mm. in height; toothed on top (c—f). It consists usually of four pillars united by cross-bars, up to eleven in number. Tables in the anterior body region (b) have in the disk more number of larger holes than those in the middle and posterior regions (c—d). In the introvert, rosettes (i—j) of 0.02—0.08 mm. length alone are profusely found, while at its border with the main body there are found, in addition, some delicate rods in scattered distribution. Pedicels are supported by tables similar to those found in general perisome; only the disk is usually of an elongate and irregular shape, but never of the form described by SLUITER from his specimen as “*zweischenkelige Gebilde mit durchlöcherten Enden.*” End-plates are well developed, exhibiting markedly concave surface on the side facing the end of pedicel; diameter 0.25—0.33 mm., the larger ones belonging to ventral pedicels. Tentacles with delicate bent supporting rods (g—h) 0.04—0.16 mm. long, with both ends branched and giving rise to some holes; often giving off branches in the middle parts also (h). Besides these rods there exist rosettes, which are connected with them by some transitional forms. Around anus there are, besides rosettes and tables, five minute anal teeth, each composed of a stout basketwork. Anal papillæ are supported by delicate branched rods resembling

those found in tentacles.

Calcareous ring.—Composed of small pieces. Radial segment (a, MVR), 19 mm. long and 5 mm. broad, giving off long posterior prolongations consisting of a number of small segments. Interradial segment (RVI and LVI), measuring 5.5—7 mm. in length and 2 mm. in breadth, is usually made up of two pieces.

Retractor muscles.—Inserted to body-wall at a distance less than one-sixth the body-length from the anterior end.

Polian vesicle.—Usually single, hanging in the left dorsal interradius, 11—24 mm. long. In one specimen an accessory vesicle of 5 mm. length was found in the left ventral interradius.

Stone-canal.—4 mm. long, provided with a minute madreporite.

Digestive tube.—Taking the course usual in the subfamily.

Respiratory trees.—Two, one in each dorsal interradius, of a length exceeding five-sixths the body-length.

Genital tubes.—Attached to the mesentery in the same manner as in *Pseudocucumis africanus* and *Phyllophorus cucumiformis* (SEMPER) [LUDWIG 25, p. 813], *viz.*, in two lines of 30 mm. length along the middorsal line. Each tube measures 5 mm. long and is dichotomously branched.

Remarks.—The presence of twenty tentacles made me hesitate somewhat in identifying the specimens at once with *Orcula hypsipyrge*. But I see the tentacle number of that species is still in a very doubtful state. v. MARENZELLER has given it to be fifteen from a much contracted specimen, while THÉEL has found thirteen tentacles, and SLUITER has given no account of the number. A careful re-examination of those specimens in that respect is very much desirable. SLUITER's statement (cited before) with regard to the elongated disk of tables in pedicels does not agree with what I have observed in my specimens, as it probably does not also with the state of the thing in v. MARENZELLER's and THÉEL's specimens. After all, I think my specimens may well be held to be specifically identical with those of

at least the last named two authors, *a fortiori* when we see that Akashi Strait, where the "Challenger" specimen studied by THÉEL had been caught, lies right close to Ōsaka Bay, whence my specimens came.

In conclusion, I beg to tender my sincere thanks to Prof. Dr. I. IJIMA for his kind supervision during the preparation of this paper.

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December 16, 1911.

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Explanation of Plate I.

Fig. 1. *Phyllophorus hypsipyrus* (v. MARENZELLER) from Ōsaka Bay. Natural size.

Fig. 2. *Phyllophorus japonicus* (v. MARENZELLER) from Ōsaka Bay. Natural size.

Fig. 3. *Phyllophorus fragilis* MITSUKURI & OHSHIMA, sp. n., from Okinawa, Liū-kiū Islands. Natural size.

Fig. 4. *Pseudocucumis africanus* (SEMPER) from Takanoshima, Awa. Natural size.

Fig. 5. *Amphicyclus japonicus* BELL from Sagami Sea. Natural size.

Fig. 6. Same, probably from Prov. Echizen. Natural size.

On Japanese freshwater Cyclopidae with descriptions of two new species and one new subspecies.

BY

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With Pl. II.

In my study of Japanese freshwater copepoda, I have thus far met with 8 species of the Cyclopidae, of which I propose to give notes in this paper. The greater part of my material was collected in several parts of Hokkaidō, principally in the ponds and ditches in and about Sapporo, in Lake Shikotsu, and in Lake Ōnuma; the remaining part was obtained in Lake Biwa (Prov. Ōmi), in Lake Kawaguchi (Prov. Suruga), in several small ponds in Prov. Musashi, and in some other localities. The specimens were thrown into formalin of about 4% strength at the time of capture and after 2-20 days were transferred into 70% alcohol.

I wish here to express my sincere thanks to Professor T. Fujita for the many help extended to me during the work.

Genus **Cyclops** Müller.

1. *Cyclops serrulatus* Fischer.

Pl. II., figs. 1—4,

Cyclops serrulatus Fischer 1851; Brady 1876; Schmeil 1891.

This almost cosmopolitan species seems to be one of the most common representative of the genus, being to be found in all seasons of the year. It can not be confounded with any other species on account of the characteristic shape of its egg-sacs. The

specimens collected near Kyōto have the three terminal joints of first antennæ provided each with an inconspicuous "Rudermembran" on the inner border. The crenulation on the rami of furca is subject to much variation, as it appears according to localities.

The habitats in Japan known to me at present are: Kyōto and Saitama in Hondō, and Sapporo in Hokkaidō.

2. *Cyclops strenuus* Fischer.

Pl. II, figs. 5—7,

Cyclops strenuus Fischer 1851.

Cyclops clausii Lubbock 1863.

This is another common species of the genus in Japan. It occurs in abundance in the muddy bottom of marshes and also in large lakes. In Lake Shikotsu (Hokkaidō) it appears in early spring and forms the main part of its plankton fauna in that season. It may be worth mentioning that specimens collected in shallow water are brown in colour, while those from open lakes of clear water present a deep red hue, as is known to be the case with *Diaptomas denticornis*.

In Hokkaidō, reproduction occurs in winter under ice, the nauplii coming forth under the same circumstance. The nauplii are seen most profusely in the months of June and July. In a laboratory aquarium with water temperature varying from 19° to 23° C., I have observed individuals laden with egg-sacs for the first time on January 31st (in 1910); and it was on the 5th of the following month that the larvae hatched out from the eggs.

The species has been recorded in Russia, England, Germany, Holland, and Hungary.

3. *Cyclops magnoctavus* Cragin.

Pll. II, figs. 8—12,

Cyclops magnoctavus Cragin 1883.

This species occurs in early spring in the neighbourhood of Sapporo. It is the smallest species so far known in Japan, the female

measuring only about 0.85 mm. in length. The body is nearly colourless excepting the red eyes and the greenish intestine. The breeding season falls in June as shown by the females carrying egg-sacs of a dark-bluish colour. The seta with which the first joint of first antennae is provided, is very long and conspicuous as shown in fig. 8. The seta of the fourth joint is not so prominent as represented in a figure given by Brady in his work.⁽¹⁾ Furthermore, I have not been able to detect the hairs which Brady observed at the base of fifth foot. The two egg-sacs, each containing 15—16 eggs, are so disposed that they come in contact on the dorsal surface of abdomen.

My specimens were obtained in Lake Biwa, in Lake Kawaguchi, and in Hokkaidō.

4. *Cyclops leuckartii* G. O. Sars.

Pl. II, figs. 13—15.

Cyclops leuckartii, G. O. Sars 1883.

Cyclops Scourfrelidi, G. S. Brady 1891.

The body is very slender, the breadth decreasing from head posteriorly to the end of thorax. The female is 1.35 mm. long. The formula of first antennæ is similar to that of *Cyclops strenuus*, being composed of 17 joints, of which the terminal two are much longer than any other and are provided each with a "Rudermembran" along the inner margin. The "Rudermembran" of terminal joint is not only serrated on margin but is also deeply notched in the middle (Fig. 15). The second joint of first maxilliped presents minute crenulation on the posterior margin. The receptaculum seminis is T-shaped.

For the first specimens of this interesting species I am indebted to

(1) G. S. Brady.—A revision of the British species of freshwater Cyclopidae and Calamidae. P. 20. London, 1891.

my friend Mr. T. Sato, by whom they were collected in Lake Kawaguchi (Province Suruga) in August 1910. Later, I have discovered this species also near Sapporo. Specimens from this latter locality differ from those from Lake Kawaguchi in being a little larger in size, besides being slightly different in the structure of the "Rudermembran." The variations are however to be looked upon as local.

5. *Cyclops signatus* Koch.

Pl. II, figs. 16—19.

Cyclops signatus, Koch 1841; Brady 1878.

Cyclops tenuicornis, Brady 1876.

The female, 1.7 mm. long, carries egg-sacs in spring, indicating the breeding season. The blue colouration of the cephalothorax is due to pigments scattered all over that part; the eyes are red as in other species. The three terminal joints of first antennæ are provided with "Rudermembran" on the inner margin. The receptaculum seminis is orange-coloured and is of a mushroom-like shape. The furcal rami are very short and densely haired on the inner margin.

The recorded habitats of this species are: northern and southern Europe, Scandinavia, Germany, Holland, France, England, and North America. It occurs frequently in the vicinity of Sapporo, but never in any great abundance.

6. *Cyclops flexipes*, n. sp.

Pl. II, figs. 20—23.

Body broad, widest in front, rather abruptly narrowed backwards. Female 1.40 mm. and male 1.25 mm. in length. First antennæ not slender, and almost reaching the posterior border of first body segment, when turned backwards; 12-jointed; 8th, 9th and 12th joints nearly equal in length and longest; 2nd, 3rd and 6th shorter, but nearly equal in length among themselves; the remaining 6 joints subequal and of a medium length. The anterior 4 pairs of

swimming feet with their 3-jointed branches, the terminal joint of which is provided with appendages in the form of spines and setae, the number of these appendages being as follows:

	1st pair of swim. feet.	2nd pair of swim. feet.	3rd pair of swim. feet.	4th pair of swim. feet.
Exopod	6	7	7	7
Endopod	6	6	6	5

Fifth foot peculiar: small, 2-jointed, the larger distal joint articulating with the inner aspect of the proximal joint instead of with the distal end of same; the appendages represented by 3 setae; the longest seta on the outer edge of distal joint pinnate; the shortest seta on the inner edge of same lanceolate; and the 3rd seta of medium length situated on the outer produced edge of the distal end of proximal joint. First abdominal segment by far longer than the three following taken together. Furcal rami about 6 times as long as broad, only slightly divergent, without hair on their inner margin. Each furcal ramus with 4 apical setae: the outermost the shortest; the innermost a little longer than the outermost; the outer of the middle two much longer than the innermost; and the inner of same the longest of all, being longer than the entire length of abdomen. Fifth setae very short; lateral seta still shorter and situated a little below the level of the distal fourth of furca.

The form, to which the present species seems to be nearest, is *C. strenuus*; but the two species differ very considerably in the following respects. In the first place, the first antenna in the new species is decidedly shorter than in *C. strenuus* in relation to the fact that it is made up of 12-joints insted of 17. Secondly, the furca in the present species is but slightly divergent and quite smooth on their inner margin, whereas in *C. strenuus* they are strongly divergent and thickly beset with hair. Thirdly, the fifth foot of the new species is peculiar in that the distal of its two component joints is long and slender, obviously differing in this respect from *C. strenuus*, in which

the same joint is thick and short with the distal end obliquely cut off. Further, the articulating point of the distal joint with the proximal is shifted very much farther inwards than in *C. strenuus*, causing in consequence the remarkable bending of the foot, which character I have availed of in naming the species. Finally, all the three setae, with which the fifth foot is provided, are very much longer than in *C. strenuus*; the inner seta of the distal joint being straightly directed, while the corresponding seta in *C. strenuus* is inwardly directed making an obtuse angle with the axis of the joint.

I have collected this new species in the vicinity of Sapporo in May, 1911. Reproduction occurs in spring. Each egg-sac contains about 25 eggs.

7. *Cyclops soli* n. sp.

Pl. II, figs. 24—26.

Body obtusely rounded in front, brown in colour, the female measuring 0.9 mm. in length. First antennæ unusually thick and short, about $\frac{1}{2}$ as long as first body segment, composed of 8 short segments, the first and fourth segments being the longest and all the rest shorter. Mouth appendages small. The anterior 4 pairs of swimming feet with their branches 3-jointed. Fifth foot very small, 1-jointed, and with two appendages at the extremity. The postero-lateral border of last thoracic segment fringed with a row of spines (fig. 25). The posterior margin of third and fourth abdominal segments slightly serrated. Furcal rami long and cylindrical, parallel with and widely separated from each other, each bearing a transverse row of several spines at the beginning of the distal fourth of its length. Of the 4 apical setae the outer and inner are the shortest and nearly equal in length; the inner of the remaining two is the longest and about as long as the entire length of abdomen, while the outer is about $\frac{1}{2}$ as long as the inner.

The present species is very closely allied to *C. fimbriatus*, but

differs from it in many points, among which the following two seem to be the most noteworthy. In the first place, this species is characterized by the presence of only 2 spines on the fifth foot (fig. 25), while *C. fimbriatus* should possess 3 of them as is obvious from the figure given by Brady in his work⁽¹⁾ (fig. 25, pl. 23). In the next place, the present species is in constant possession of a transverse row of spines on furcal ramus, which seems to be absent in Brady's species, since this author neither mentions nor figures anything answering to it.

The species is apparently an inhabitant of the muddy bottom of lakes and marshes. My specimens were captured in the vicinity of Sapporo, and it is of interest in fishcultural respect that the animals are often found in the stomach of the carp. The breeding season is not yet exactly known. I have found each egg-sac to contain about 12 eggs.

8. *Cyclops phaleratus japonicus* n. subsp.

Pl. II, figs. 27—29.

Body appears to be rather short on account of the wide abdomen. It gradually narrows backwards, just as in *Canthocamptus*. The first antenna is short, not exceeding the first body segment in length. Body brown in colour, eyes red, the second thoracic segment practically colourless. All the 4 pairs of swimming feet are rather short; the 1-jointed fifth foot is likewise very short. On the hind edge of abdominal segment there is on each side a strong spine about equal to that segment in length. Mouth appendages small and closely put together. Each ramus of furca is short and bears three apical setae, of which the innermost is the longest, the outermost the shortest, and the middle about half as long as the former. Both the innermost and middle setae are not haired, but

(1) Brady, G. S., A monograph of the free and semi-parasitic Copepoda of the British Island, vol. I, p. 116 (London).

are furnished on their outer margin with a row of peculiar tubercular bodies. Each ramus of furca is provided with a row of rod-like processes, which row embraces the furca obliquely from the outside at the end of the proximal third of its length (fig. 29). The rods are longest in the middle of the row and become shorter by degrees toward its both ends. Of this peculiar structure nothing is given in Brady's description (*Z. c.*) of the type species, but it constitutes a very characteristic feature of the form which is here made into a new subspecies.

This cyclops is found in the vicinity of Sapporo, but seems to be very rare.

Explanation of Pl. II.

Figs. 1—4, *Cyclops serrulatus* Fischer.

Fig.	1.	Left branch of furca.	398 ×.
„	2.	Fifth foot.	764 ×.
„	3.	First antenna.	232 ×.
„	4.	Receptaculum seminis.	337 ×.

Figs. 5—7, *Cyclops strenuus* Fischer.

„	5.	Dorsal view of female.	55 ×.
„	6.	Fifth foot.	244 ×.
„	7.	Receptaculum seminis.	150 ×.

Figs. 8—12, *Cyclops magnocarpus* Cragin.

„	8.	First antenna.	334 ×.
„	9.	Fifth foot.	626 ×.
„	10.	Maxilla.	401 ×.
„	11.	Labrum.	401 ×.
„	12.	Second maxilliped.	496 ×.

Figs. 13—15, *Cyclops leuckarti* G. O. Sars.

„	13.	Dorsal view of female.	55 ×.
„	14.	Fifth foot.	334 ×.
„	15.	Three distal joints of first antenna.	337 ×.

Figs. 16—19, *Cyclops signatus* Koch.

„	16.	Furca.	
„	17.	Three distal joints of first antenna.	337 ×.
„	18.	Fifth foot.	250 ×.
„	19.	Receptaculum seminis.	110 ×.

Figs. 20—23, *Cyclops flexipes* n. sp.

„	20.	Dorsal view of female.	85 ×.
„	21.	Fifth foot.	334 ×.
„	22.	Right branch of furca.	334 ×.
„	23.	First antenna.	244 ×.

Figs. 24—26, *Cyclops soli* n. sp.

Fig.	24.	Dorsal view of female.	110×.
„	25.	Fifth foot.	398×.
„	26.	First antenna.	337×.

Figs. 27—29, *Cyclops phaleratus japonicus* n. subsp.

„	27.	Dorsal view of female.	85×.
„	28.	Fifth foot.	496×.
„	29.	Distal part of furca.	244×.

Die Termiten Japans.*

Von

Nils Holmgren

Stockholm.

Die Kenntniss der japanischen Termitenfauna war bis jetzt sehr arm. Durch Reisenden wurden freilich zu verschiedenen Museen einige sporadische Stücke heimgebracht, aber mit einer einzigen Ausnahme wurden sie nicht beschrieben. Auch muss zugestanden werden, dass die Beschreibung von einer Imago hie, und einem Soldaten da, von wenig Interesse war, und den Termitenforschern wenig anziehend sein könnte. Seitdem aber nun die japanischen Forscher sich selbst der Erforschung ihrer Fauna gewidmet haben, ist es ja zu erwarten, dass sie mit gewöhnlicher Gründlichkeit und Eifer die Kenntniss des Tierweltes ihres Landes erforschen werden. In termitologischer Hinsicht ist nun diese Erforschung begonnen, und WATASÉ und HOZAWA

* The specimens of the Japanese termites, which formed the material for Prof. Holmgren's present paper, had been sent from the Zoological Institute of the Imperial University of Tokio. Prof. Holmgren's more detailed report on the Japanese termites will be incorporated in his forthcoming *Monographie der Termiten des orientalischen Regions*.

As Prof. Holmgren points out, the species of the Japanese termites known to the naturalists of Europe and America have thus far been extremely meagre—only two in fact. His present paper brings them up to twelve.

In justice to the Japanese naturalists, however, it must not be supposed that they have been indifferent to the rich termite fauna of the country. In fact, the termites have been made the subject of much study within recent years in this country, chiefly in view of the fact that some of the species do extensive injury to wooden structures.

Neither their systematics have been neglected on their part. Written in the Japanese language, however, with no organization at present, whereby the contents of such productions are made intelligible to the workers of the western world, it is not to be expected that such works reach very far, unless the authors took the trouble of translating them themselves, which in the case of the Japanese termite literature, had never been done.

Although further details may be expected in his forthcoming monograph of the Oriental termites, Prof. Holmgren's present paper on the termites of Japan will be of much value to all workers who are interested in the same subject, and to those who take interest in the problem of zoogeography for this part of the world.—S. WATASÉ.

haben schon eine beträchtliche Sammlung besonders aus Formosa zusammengebracht, welche Professor WATASÉ mir gütigst für Bearbeitung zur Verfügung stellte. Die Sammlung umfasst 17 Nummern. Diese Sammlung ist besonders deshalb sehr werthvoll, weil sie von den meisten Arten alle drei Stände enthält, ein Verhältnis, das leider nicht für allen Sammlungen zutrifft.

Aus Japan waren bis jetzt nur zwei Termitenarten in der nicht japanischen Litteratur behandelt, nämlich :

Leucotermes speratus (KOLBE.)

Coptotermes formosæ HOLMGREN.

Durch WATASÉ's und HOZAWA's Sammlungen ist nun die Kenntniss der Termitenfauna Japans mit 10 Arten bereichert worden.

List der japanischen Termiten.

Fam. Protermitidæ HOLMGR.

Subfam. Termopsinæ HOLMGR.

Hodotermopsis japonicus, n. sp.

Subfam. Calotermitinæ HOLMGR.

Calotermes (*Neotermes*) *koshunensis*, n. sp.

„ (*Glyptotermes*) *satsumaensis*, n. sp.

„ (*Glyptotermes*) *Hozawæ*, n. sp.

„ (*Cryptotermes*) *formosæ*, n. sp.

Fam. Mesotermitidæ HOLMGR.

Subfam. Leucotermitinæ HOLMGR.

Leucotermes speratus (KOLBE).

Subfam. Coptotermitinæ HOLMGR.

Coptotermes formosæ HOLMGREN.

Arrhinotermes japonicus, n. sp.

Fam. Metatermitidæ HOLMGR.

Mirotermes-Reihe

Capritermes sulcatus, n. sp.,

Termes-Reihe*Odontotermes formosanus*, n. sp.*Syntermes*-Reihe.*(Eutermes)**Eutermes piciceps*, n. sp.„ (*„*) *Watasei*, n. sp.

Die Kenntniss, welche wir durch diese Sammlung erhalten haben, erlaubt uns die Termitenfauna von Japan (mit Formosa) zu beurteilen. Es scheint mir als wären zwei Elemente da vorhanden, nämlich, ein nördliches und ein südliches. Das nördliche wird von *Leucotermes speratus* und auch wahrscheinlich von *Hodotermopsis japonicus** repräsentiert. Alle übrige Arten sind rein südliche Formen, deren nächsten Verwandten im Tropischen Ostindien vorkommen. Hier unten gebe ich eine Liste der bis jetzt bekannten Japantermiten mit Angabe der nächsten Verwandte und ihrer Heimat.

Japantermiten	Nächste Verwandte derselben	Deren Heimat
Nördliche Arten :		
<i>Hodotermopsis japonicus</i> , n. sp.	<i>Hodotermopsis Sjöstedti</i> HOLMGR.	Tonkin
	<i>Termopsis</i> HEER.	Nord-Amerika
	<i>Archotermopsis</i> DESN.	Kashmir

* Amami-Ōshima, where *Hodotermopsis japonicus* was found, is located in the semi-tropical region of the Japanese Archipelago. Separated from two islands of Yakushima and Tanégashima on the north-east, by a stretch of water 170 miles in length, called "Shichitonada," literally "The Rough Sea of Seven Isles," the island of Amami-Ōshima marks off the extreme north-eastern boundary of the Oriental Region; the two islands above named, at the other end of the sea, forming the south-western out-posts of the Palearctic section of the Japanese Empire. The details for the above view will be presented elsewhere, but I am inclined to think that the new termite *Hodotermopsis japonicus*, instead of being a representative of the northern species, must be considered as a distinct southern element. I am the more disposed to take this view, since the species most nearly allied to it is found in Tonkin, as Prof. Holmgren informs us.—S. WATASE.

Japantermitten	Nächste Verwandte derselben	Deren Heimat
<i>Leucotermes speratus</i> , (KOLBE)	<i>L. flavipes</i> KOLLAR.	Nord-Amerika
	<i>L. lucifugus</i> ROSSI.	Europa, Nord-Afrika
	<i>L. virginicus</i> BANKS.	Nord-Amerika
Südliche Arten :		
<i>Neotermes kosshuensis</i> , n. sp.	<i>N. militaris</i> DESN.	Ceylon
	<i>N. laticollis</i> HOLMGR.	Madagascar
	<i>N. artocarp</i> HAV.	Sarawak
	<i>N. papua</i> DESN.	Neu-Guinea
	<i>N. Schultzei</i> HOLMGR.	Neu-Guinea
<i>Glyptotermes satsumaensis</i> , n. sp.	<i>G. brevicaudatus</i> HAV.	Sarawak
<i>Glyptotermes Hozawæ</i> , n. sp.	<i>G. dilatatus</i> BUGN.	Ceylon
<i>Cryptotermes formosæ</i> , n. sp.	<i>G. dentatus</i> HAV.	Sarawak
<i>Coptotermes formosæ</i> , HOLMGR.	<i>C. domesticus</i> HAV.	Singapore und Sarawak
	<i>C. Heimi</i> WASM.	Vorderindien
	<i>C. ceylonicus</i> HOLMGR.	Ceylon
	<i>C. travians</i> HAV.	Malayscher Halbinsel, Borneo
<i>Arrhinotermes japonicus</i> , n. sp.	<i>Arr. canalifrons</i> SJÖST.	Madagascar
	<i>Arr. inopinatus</i> , SILV.	Samoa-Inseln
	<i>Arr. flavus</i> , BUGN.	Ceylon
<i>Odontotermes formosanus</i> , n. p.	<i>O. sinensis</i> , n. sp.	China (Formosa ?)
	<i>O. assamensis</i> , n. sp.	Assam
	<i>O. dives</i> HAG.	Manila
<i>Capritermes sulcatus</i> , n. sp.	<i>C. medius</i> , n. sp.	Sarawak

Japantermiten	Nächste Verwandte derselben	Deren Heimat
<i>Eutermes piciceps</i> , n. sp.	<i>C. nemorosus</i> HAV.	Sarawak
	<i>C. ceylonicus</i> HOLMGR.	Ceylon
	<i>E. matongensisiformis</i> f. <i>obscurus</i> , n. f.	Christmas Islands
	<i>E. sarawakensis</i> -Gruppe	Hinterindien, Neu Guinea, Australien, etc.
<i>Eutermes Watasei</i> , n. sp.	<i>E. gracilirostris</i> DESN.	Neu-Guinea

Von den oben erwähnten Gattungen ist die Verbreitung von *Arrhinotermes* bemerkenswerth. Diese Gattung ist nämlich bisjetzt nur auf Inseln gefunden :

Arr. oceanicus WASM.—von den Cocos-Inseln (bei Costa Rica)

Arr. canalifrons SJÖST.—aus Madagascar, Seychellen und Comoren

Arr. flavus BUGN.—von Ceylon

Arr. inopinatus SILV.—von den Samoa-Inseln

Arr. simplex HAG.—aus Cuba

Arr., n. sp.—aus der Jaluit-Atolle.

Diese Verbreitung ist ja sehr eigentümlich, und man wäre dazu geneigt die Gattung als eine Insel-Gattung zu betrachten. Jedoch ist es wohl möglich, dass diese Verbreitung nur auf mangelhafter Kenntniss beruht, und dass es sich einmal zeigen wird, dass *Arrhinotermes* auch am Festlande vorkommt. Diese deutet einige Stücke an, welche im Hamburger Museum vorkommen, die mit "Costa Rica" bezettelt sind, und die einer neuen Art angehören. Jedoch können sie recht wohl, auf den Costa Rica Inseln gesammelt sein. Davon wissen wir jedoch nichts.

Fam. **Protermitidæ** HOLMGR.

Subfam. **Termopsinæ** HOLMGR.

Gattung ***Hodotermopsis*** HOLMGR. (Termitenstudien II.)

Hodotermopsis japonicus, n. sp.

Imago: Unbekannt.

Soldat: Kopf braunrot, mit schwarzem Vorderteil. Oberlippe braun. Körper im übrigen rostgelb. Hinterleib mit grau durchschimmerndem Darminhalt.

Behaarung sehr spärlich (hie und da einzelne Borsten!).

Kopf ziemlich flach, oval, nach vorn verschmälert, in der Mitte etwas eingedrückt. Stirn gegen das Clypeobasale recht stark in der Quere eingedrückt. Clypeobasale sehr kurz, durch die Eindrückung sehr scharf von der Stirn begrenzt. Clypeoapicale weiss, mit gelblichen Chitinstützen. Oberlippe beinahe sechseckig, mit abgerundeten Ecken und vorn etwas eingedrückt. Antennenleisten mit einer deutlichen runden Verbreitung oberhalb der Antennenwurzeln. Mandibeln kräftig, mit der für *Hodotermopsis* (und *Hodotermes*!) charakteristischen Be-
zahnung. Der äussere Zahn des rechten Oberkiefers besitzt zwei Spitzen, von denen besonders die hintere lang und zugespitzt ist. Antennen lang, 25-gliedrig. Basis der äusseren Glieder beinahe schaftförmig verschmälert, hell. 2. Glied kürzer als 3. und 4. zusammen-
genommen; 3. Glied am kleinsten, quer; 4. so lang wie breit.

Pronotum halbmondförmig ohne prononcierten Vorderlappen, vorn stark bogenförmig konkav; mit spitzen Vorderecken, hinten schwach ausgerandet. Meso- und Metanotum quer elliptisch. Cerci lang, schmal 3-gliedrig. Styli lang und schmal.

	<i>H. japonicus</i>		<i>H. Sjöstedti</i>		
	A	B	A	B	C
Körperlänge	16 mm.	14.5 mm.	14.5 mm.	15 mm.	15 mm.
Kopflänge mit Mandibeln	7 „	6.54 „	7.2 „	7.2 „	7.3 „
„ ohne „	4.5 „	4.07 „	4.7 „	4.5 „	4.5 „
Kopfbreite	4.07 „	3.7 „	4.14 „	4.07 „	4.25 „
Länge des Pronotums	1.29 „	1.15 „	1.48 „	1.44 „	1.52 „
Breite „ „	2.96 „	2.77 „	3.33 „	3.14 „	3.33 „
„ „ Metanotums	2.52 „	2.22 „	2.59 „	2.59 „	2.77 „

Arbeiter: Es liegen einige Arbeiter vor, welche keine Spuren von Flügelscheiden besitzen. Sie sind deutlich kleiner als die Arbeiter von *H. Sjöstedti*. Die Verschiedenheit geht aus den Massen hervor:

	<i>H. japonicus</i>			<i>H. Sjöstedti</i>		
	A	B	C	A	B	C
Körplänge	12 mm.	10.5 mm.	11 mm.	13 mm.	12 mm.	11 mm.
Kopfbreite	2.7 „	2.7 „	2.7 „	3.07 „	3.07 „	3.1 „
Breite des Pronotums	1.96 „	1.89 „	2 „	2.52 „	2.59 „	2.48 „

Fundort: Amami-Oshima, 16. Apr. 1909, WATASÉ coll.

Bemerkung: *Hodotermopsis japonicus* steht *H. Sjöstedti* aus Tonkin sehr nahe und ist vielleicht nur eine Rasse von dieser Art und unterscheidet sich hauptsächlich an der kleineren Statur. Morphologisch stimmen die beide Arten beinahe vollständig überein. Nur der erste Zahn der linken Oberkiefer ist verschieden, indem er bei *H. japonicus* eine kurze vordere und eine hintere (sehr) scharfe Spitze besitzt. Bei *H. Sjöstedti* ist dieser Zahn aber einfach zweilappig mit stumpfen Lappen.

Hodotermopsis Sjöstedti ist in meinen Termitenstudien II. photographisch abgebildet, und diese Abbildung giebt auch eine gute Vorstellung von *H. japonicus*.

Subfam. *Calotermitinæ* HOLMGR.

Gattung *Calotermes* HAG.

Untergattung *Neotermes* HOLMGR.

Calotermes (*Neotermes*) *koshunensis* n. sp.

Imago: Kopf und Pronotum rotbraun, Körper im übrigen hellbraun. Unterseite und Beine bräunlich gelb. Flügel hyalin, schwach gelblich angehäucht, mit bräunlichen vorderen Rippen.

Behaarung spärlich.

Kopf breit oval; Facettenaugen mittelgross, flach. Ocellen von mittler Grösse, dicht an den Augen gelegen. Clypeobasale sehr kurz, von der Stirn gut abgegrenzt. Clypeoapicale gross, weiss, mit Chitinstützen. Oberlippe schalenförmig gewölbt, stark geneigt. Mandibeln mit gewöhnlicher *Calotermes*-Bezahnung. Antennen 18-gliedrig; 2. und 3. Glied etwa gleich lang; 4. undeutlich kürzer.

Pronotum breiter als der Kopf mit den Augen, quer, vorn konkav, hinten schwach eingebuchtet, nahe dem Vorderrande mit zwei Quereindrücken. Meso- und Metanotum hinten breit gerad, letzteres möglicherweise schwach konkav. Vorderflügel mit grosser Schuppe: Flügelmembran grob und weitmaschig reticuliert. Die Subcosta reicht über den ersten Drittel des Flügels und tritt basal, innerhalb der Schuppe, in einer Costarippe ein. Der Radius erstreckt sich über zwei Drittel des Flügels und besitzt vorn eine Subcostaverbindung. Radiussector, mit ca. 4 längeren vorderen Zweigen und ebensoviele kurze Spitzenverbindungen. Die Mediana verläuft parallel mit dem Radiussector mit dem sie durch ca. 12 Verbindungen vereint ist. Cubitus mit ca. 14 Zweigen, von denen die 6-7 inneren kräftiger sind. Subcosta der Hinterflügel rudimentär. Die Mediana geht von dem ersten Viertel des Flügels aus. Alle Tibien mit 4 Apicaldornen. Onychium vorhanden, ziemlich gross, viereckig. Cerci kurz. Styli beim ♂ vorhanden.

Länge mit Flügeln 15 mm.

Länge ohne Flügeln	8.5-9 mm.
„ der Vorderflügel (ohne Schuppe) ..	11.7 „
Kopflänge	2 „
Kopfbreite	1.7 „
Länge des Pronotums	1 „
Breite des „	1.92 „

Soldat: Kopf gelbbrot, nach vorn gebräunt. Körper gelblich-weisslich. Behaarung spärlich.

Kopf langgestreckt viereckig, ziemlich gewölbt. Stirn nach vorn allmählig abfallend; Abfallender Teil in der Mitte ziemlich stark etwa dreieckig eingedrückt. Facettenaugen als helle Flecke hervortretend. Antennenleisten ein wenig verbreitert. Clypeobasale flach, sogar eingebuchtet, quer viereckig, von der Stirn nicht deutlich abgegrenzt. Clypeo-apicale kurz, quer viereckig. Oberlippe beinahe so lang wie breit, viereckig mit abgegründeten Ecken und vorn in der Mitte bisweilen etwas eingedrückt. Linker Oberkiefer mit 6 Zähnen ausserhalb des Basalzahnes. Rechter mit 2 grossen Zähnen. Antennen 15-16-gliedrig. 3. Glied ein wenig grösser als 2., stumpf kegelförmig; 4. viel kürzer als 3. und so lang wie 5., etwa so lang wie breit.

Pronotum breiter als der Kopf, vorn stark konkav, hinten kaum ausgerandet. Cerci kurz, Styli vorhanden. Beine kurz und dick, Hüfte und Oberschenkel besonders kräftig.

Körperlänge	9-12.5 mm.
Kopflänge mit Oberkiefern	4.81 „
„ ohne „	3.33 „
Kopfbreite	2.33 „
Länge des Pronotums	1.11 „
Breite „ „	2.44 „

Arbeiter mit und ohne Flügelscheiden, ebenso Nymphen liegen vor.

Fundort: Naha (Riu-kiu), 9. Apr. 1909, WATASÉ coll; Botel-tobago (Formosa); WATASÉ coll.

Untergattung *Glyptotermes* HOLMGR.*Calotermes (Glyptotermes) satsumaensis*. n. sp.

Imago: Kopf rötlich braun, Pronotum heller braun (braungelb). Hinterlieb gelblich.

Behaarung sehr spärlich.

Kopf breit oval. Facettenaugen mittelgross, nur wenig ausstehend. Ocellen klein, in der unmittelbaren Nähe der Augen gelegen. Clypeobasale undeutlich begrenzt, sehr kurz. Clypeoapicale grösser, weiss, mit Chitinisierungen. Labialpalpen kurzgliedrig. Antennen 15-gliedrig, kurz, nach aussen verdickt; 2. Glied so lang wie 3. und 4. zusammengenommen; 3. kürzer als 4.

Pronotum schmaler als der Kopf, vorn stark konkav, hinten bogenförmig. Flügel hyalin mit braunen vorderen Rippen, mit stark höckeriger Flügelmembran. Radiussector und Mediana mit einander parallel laufend ohne Zweigen, aber mit mehreren schwachen Verbindungen. Cubitus sehr undeutlich, mit ca. 15 Zweigen.

Länge mit Flügeln.....	11.5 mm.
„ ohne „	7 „
„ der Vorderflügel (ohne Schuppe)..	9 „
Kopflänge.....	1.66 „
Kopfbreite	1.48 „
Länge des Pronotums	0.74 „
Breite „ „	1.29 „

Grosser Soldat: Kopf braunrot, nach vorn etwas gebräunt. Körper gelblich-braungelblich.

Behaarung spärlich.

Kopf langgestreckt, parallelseitig rechteckig, viel länger als breit (etwa doppelt), flach cylindrisch mit abfallender Stirn, der in der Mitte rinnenförmig eingedrückt ist. Facettenaugenrudimente deutlich, etwas gewölbt. Ocellen als helle Flecke im rudimentären Zustande vorhanden. Clypeobasale sehr kurz, kaum abgegrenzt. Clypeoapicale

weiss, mit Chitinisierungen. Oberlippe über den ersten Drittel der Oberkiefer reichend, breiter als lang, mit beinahe kreisförmig abgerundeten Spitze. Oberkiefer kurz und basal breit dreieckig, mit gekrümmter Spitze. Linker Kiefer mit 3 deutlichen (und einen undeutlichen) Zähnen oberhalb des Basalteiles. Rechter Kiefer mit zwei Zähnen, beide innerhalb der Mitte. Antennen sehr kurz 13-gliedrig, nach aussen etwas verdickt. 2. Glied kaum länger als breit, so lang wie 4., und etwas länger als 3.

Pronotum etwa so breit wie der Kopf, sehr kurz, vorn konkav, mit stark abgerundeten Seiten und bogenförmigen Hinterrand. Meso- und Metanotum mit kurzen Flügelscheiden. Beine kurz. Hinterleib langgestreckt. Cerci wohlentwickelt. Styli vorhanden.

Körperlänge	11.5 mm.
Kopflänge mit Oberkiefern	4.26 „
Kopflänge ohne Oberkiefern	3.22 „
Kopfbreite	1.81 „
Länge des Pronotums	0.78 „
Breite „ „	1.74 „

Kleiner Soldat: Stimmt beinahe vollständig mit den grossen Soldaten. Pronotum ist aber vorn weniger stark konkav, besitzt spitzwinkelig abgerundeten Vorderecken und geraden Hinterrand. Pronotum ist relativ länger als bei den grossen Soldaten. Meso- und Metanotum ohne Flügelscheiden.

Körperlänge	8.25 mm.
Kopflänge mit Oberkiefern	3.81 „
„ ohne „	2.85 „
Kopfbreite	1.48 „
Länge des Pronotums	0.67 „
Breite „ „	1.41 „

Es liegen einige Larven mit mehr oder weniger entwickelten Flügelscheiden vor.

Fundort: Formosa, HOZAWA coll; Provinz Satsuma (MATSUMURA).

Calotermes (Glyptotermes) Hozawa, n. sp.

Soldat: Kopf gelbrot-braunrot, nach vorn gebräunt. Pronotum schwach gebräunt, Körper im übrigen gelblich-weiss, mit rot durchschimmerndem Darminhalt.

Behaarung spärlich.

Kopf dick, walzenförmig, beinahe cylindrisch, etwa ein halbes Mal länger als breit, fast so hoch wie breit. Stirn vorn recht stark abfallend, in der Mitte recht stark eingedrückt. Seitenteile der Stirn abgerundet, gewölbt. Transversalnaht sichtbar. Augenrudimente als helle Flecke hervortretend. Clypeobasale sehr kurz, nicht deutlich begrenzt. Clypeoapicale quer, weiss mit Chitinisierungen. Oberlippe viereckig, etwas länger als breit, über zwei Drittel der zusammengelegten Oberkiefer reichend. Oberkiefer kurz und kräftig. Linker Oberkiefer mit 3, rechter mit 2 schwachen Zähnen. Antennen sehr kurz, nach aussen verdickt, 10-11-gliedrig. Wenn 10-gliedrig: 3. Glied länger als 2., kegelförmig; 4. Glied viel breiter als 2., quer. Wenn 11-gliedrig: 3. Glied viel kleiner als 2.; 4. so lang wie 2., aber dicker (das 3. Glied der 10-gliedrigen Antennen ist hier geteilt!). Endglied oval, viel schmaler als das vorletzte.

Pronotum quer, viereckig, vorn etwas winkelig konkav, hinten schwach ausgeschnitten. Seiten nach hinten schwach konversierend. Meso- und Metanotum hinten sehr schwach ausgerandet. Hinterleib langgestreckt. Cerci kurz. Styli vorhanden.

Körperlänge	6 mm.
Kopflänge mit Oberkiefern	1.63 „
„ „ ohne „	1.26 „
Kopfbreite	0.89 „
Höhe des Kopfes	0.81 „
Länge des Pronotums	0.44 „
Breite „ „	0.89 „

Es liegen einige etwa 6 mm. lange, schmale, relativ kleinköpfige

Larven und Nymphen vor. Arbeiter (?) mit sehr kurzen Flügelstummeln giebt es auch.

Fundort: Formosa, 3. Juni 1911. HOZAWA coll.

Bemerkung: *Glyptotermes dentatus* aus Sarawak steht am nächsten. Diese Art besitzt aber als Soldat einen längeren und weniger dicken Kopf und schmälere Antennen.

Untergattung *Cryptotermes* BANKS.

Calotermes (^p~~*Cryptotermes*~~) *formosa*, n. sp.

Imago: Gelbbraun, Unterseite heller. Flügel irisierend, mit braunen vorderen Rippen.

Behaarung spärlich.

Kopf langgestreckt, viereckig oval, nach vorn kaum verschmälert. Augen klein, wenig ausstehend. Ocellen ziemlich klein, den Augen berührend. Kopfnähte nicht sichtbar. Transversalband mit einer Y-förmigen hellen Fleck. Clypeobasale sehr klein; Clypeoapicale länger, hell. Oberlippe stark geneigt, schalenförmig. Antennen ziemlich lang, loose gegliedert, 15-gliedrig. 2. Glied ungefähr so lang wie 3.; 4. etwas kürzer, quer; 7. Glied so lang wie breit; übrige länger als breit.

Pronotum quer, viereckig, mit abgerundeten Ecken, vorn etwas konkav, transversal gewölbt. Meso- und Metanotum hinten breit, gerade abgeschnitten. Flügelmembran stark warzig. Subcosta rudimentär. Radius sich über den ersten Viertel des Vorderflügels streckend. Radiussector mit etwa 7-8 Zweigen, von denen die erste im inneren Viertel des Flügels beginnt. Mediana und Cubitus sehr schwach markiert. Die Mediana vereinigt sich an der Austrittsstelle des Vierten Radiussectorzweiges mit dem Radiussector. Cubitus mit ca. 12-13 Zweigen. Die Spitze desselben kehrt sich etwas nach vorn und endet in der Flügelspitze. Cerci kurz. Styli beim ♂.

Länge mit Flügeln	8-8.5	mm.
„ ohne „	5-5.5	„
„ der Vorderflügel	6-6.5	„

Länge des Kopfes	1.04-1.26 mm.
Breite „ „	0.85-0.99 „
Länge „ Pronotums.....	0.44-0.55 „
Breite „ „	0.85-0.92 „

Soldat: Stimmt beinahe vollständig mit *Cryptotermes domesticus* aus Sarawak, ist aber grösser und dunkler gefärbt.

Kopf im Nacken rotbraun, sonst schwarz; Antennen und Hinterleib rostbraun. Thorax und Beine ziemlich dunkelbräunlich. Kopf vorn nicht zweilappig. Antennen, Pronotum, etc. wie bei *Cr. domesticus*.

	<i>Cr. formosæ</i>	<i>Cr. domesticus</i>
Körperlänge	4.5-5 mm.	4 mm.
Kopflänge mit Oberkiefern.	1.78 „	1.55 „
	<i>Cr. formosæ</i>	<i>Cr. domesticus</i>
Kopflänge ohne Oberkiefern.	1.48 mm.	1.29 mm.
Kopfbreite.....	1.18-1.26 „	1.18 „
Länge des Pronotums.. ...	0.63-1.74 mm.	0.52 mm.
Breite „ „	1.15 „	1 „

Nymphen, Arbeiter (?) und Larven von verschiedener Grösse liegen vor.

Fundort: Botel-tobago (Formosa), 14. Juni 1911; HOZAWA coll. Formosa, Museum Wien.

Bemerkung: Die Imagines dieser Art sind von *Cr. domesticus* (HAV.) leicht zu unterscheiden, indem die Mediana bei *Cr. domesticus* etwa an der Mitte des Flügels mit dem Radiussector vereint. Bei *Cr. formosæ* vereinen sie sich erst weit ausserhalb der Flügelmitte. Ausserdem ist *Cr. formosæ* grösser. Die beide Arten stehen aber einander äusserst nahe, und es wäre vielleicht berechtigt sie nur als Rassen einer Art aufzufassen.

Fam. *Mesotermitidæ* HOLMGR.Subfam. *Coptotermitinæ* HOLMGR.Gattung *Coptotermes* WASM.*Coptotermes formosæ* HOLMGR.

Imago: Kopf braun, nach vorne heller. Clypeus und Mundteile gelb. Pronotum gelbbraun mit Y-förmiger Zeichnung noch heller. Hinterleib oben hellbraun, unten gelb. Tibien und Tarsen etwas dunkler als die hellgelblichen Oberschenkel. Flügel hyalin, gelblich angehaucht, mit braunen vorderen Rippen.

Behaarung lang und dicht. Besonders die Flügel sind dicht und recht lang behaart.

Kopf breit oval, beinahe kreisrund. Augen mittelgross, etwas ausstehend. Ocellen von den Augen nur wenig entfernt. Fontanelle wenig sichtbar, punktförmig, etwas erhaben; Stirn in Umgebung der Fontanelle fein runzelig. Clypeobasale sehr kurz. Oberlippe klein, nach aussen erweitert. Antennen 21-gliedrig; 2. Glied so lang wie 3. und 4. zusammengenommen; 3. Glied kürzer als 4.

Pronotum halbmondförmig, hinten schwach eingeschnitten. Flügel lang, stark behaart. Mediana einfach oder nur wenig geteilt. Cubitus mit ca. 10 Zweigen, von denen die inneren kräftiger sind. Ein schwaches "Subcostalstrich" kommt vor.

Länge mit Flügeln	14-15-16 mm.
„ ohne „	6.5-8 „
„ der Vorderflügeln	11-12 „

	A	B	C
Länge des Kopfes..	1.63 mm.	1.66 mm.	1.6 mm.
Breite „ „ ..	1.55 „	1.59 „	1.55 „
Länge „ Pronotums	0.81 „	0.81 „	0.81 „
Breite „ „ ..	1.41 „	1.44 „	1.33 „

Soldat: Stimmt so vollständig mit *Coptotermes ceylonicus* überein

dass ich die beiden Arten nicht sicher unterscheiden kann. *C. formosæ* ist aber vielleicht etwas grösser.

Arbeiter: Nicht deutlich von *C. ceylonicus* verschieden.

Fundort: Naha, WATASE coll; Formosa, WATASE, HOZAWA coll. Formosa, OSHIMA, coll; Kagoshima, IKEDA coll; Marugame, NAKAYAMA coll.

Bemerkung: Die Imagines von *C. formosæ* lassen sich leicht von der übrigen *Coptotermes* Imagines unterscheiden. Schon ihre Grösse reicht aus, um sie den bisjetzt bekannten Arten zu differenzieren. Ausserdem sind die Flügel viel stärker behaart als bei den nahestehenden *C. Havilandi* und *C. ceylonicus*.

Was aber den Soldaten betrifft, so können die meisten indischen *Coptotermes* Arten nicht ganz sicher von einander in gewöhnlicher Weise getrennt werden. Nur *C. Gestroi* ist von den übrigen durch seinen flachen breiten Kopf und vorn tief eingeschnittenen breiten Pronotum leicht zu unterscheiden.

Gattung *Arrhinotermes* WASM.

Arrhinotermes japonicus, n. sp.

Imago: Unbekannt.

Soldat: Kopf und Pronotum hellgelb. Körper strohgelb.

Behaarung sehr spärlich.

Kopf breit oval, nach vorn verschmälert, ziemlich flach. Fontanelle in normaler Lage, kreisrund, mit sehr deutlicher Fontanellendrüse. Von der Fontanelle geht nach vorn eine deutliche Rinne. Facettenaugen deutlich, weisslich. Clypeobasale kurz. Oberlippe zungenförmig mit breit abgerundeter hyaliner Spitze. Oberkiefer säbelförmig, mit *Coptotermes* Bezahnung. Antennen 17-gliedrig; 2. Glied so lang wie 3., oder kaum bemerkbar kürzer; 4. etwas kürzer als 3.

Pronotum flach, viel schmaler als der Kopf, vorn etwas konkav, hinten kaum eingeschnitten.

	<i>Arr. japonicus</i>	<i>Arr. canalifrons</i>
Länge des Kopfes	7 mm.	6 mm.
Kopflänge mit Oberkiefern..	2.7 „	2.48 „
„ ohne „ ..	1.78 „	1.59 „
Kopfbreite	1.41 „	1.29 „
Länge des Pronotums	0.59 „	0.52 „
Breite „ „	1.11 „	1.04 „

Arbeiter: Kopf weisslich-gelb. Körper weisslich.

Kopf beinahe kreisrund, dick. Facettenaugen als deutliche helle Flecke vorhanden. Fontanelle dreieckig, weiss. Kopfnähte nicht sichtbar. Clypeobasale etwas gewölbt, kürzer als seine halbe Breite. Antennen 14-16-gliedrig. 3. Glied bei 14-gliedrigen so lang wie 2.; bei 16-gliedrigen ist 3. Glied in drei kurzen glieder geteilt.

Pronotum flach, halbkreisförmig. Meso- und Metanotum breiter, quer, elliptisch.

Körperlänge	4-4.5 mm.
Kopfbreite	1.07-1.26 „
Breite des Pronotums	0.74-0.96 „

Ergatoide Geschlechtstiere: Liegen in Mengen vor.

Braungelb, glatt.

Kopf beinahe kreisrund. Kopfnähte sichtbar. Fontanelle gross, dreieckig-oval. Facettenaugen klein, weisslich. Ocellen sehr klein, von den Augen wenig entfernt. Clypeobasale gewölbt, kürzer als seine halbe Breite. Antennen 16-19-gliedrig. Glieder 3.-6. sehr kurz. Antennen in der Mitte am dicksten, gegen die beiden Enden verschmälert.

Pronotum flach, schmaler als der Kopf. Meso- und Metanotum etwas breiter als Pronotum, mit oder ohne Flügelscheiden.

Grösse sehr variabel.

Länge	4.2-5.3 mm.
Kopfbreite	1.15-1.22-1.41 „
Breite des Pronotums	0.92-1.26 „

Fundort: Botel-tobago, HOZAWA coll.

Bemerkung: Diese Art steht der madagascarischen *Arr. canalifrons* (Sj.) am nächsten, und die Soldaten der beiden Arten lassen sich beinahe nur an den Dimensionen unterscheiden. Die ergatoide Geschlechtstiere sind besonders im Bau der Antennen verschieden, indem diese bei *Arr. japonicus* in der Regel in der Mitte etwas verdickt und nur 16–19-gliedrig sind, während jene bis 22-gliedrige Antennen besitzt. Ferner sind das Mesonotum und Metanotum bei *Arr. canalifrons* viel breiter als bei *Arr. japonicus* und besitzen grossen Flügelscheiden.

Bei *Arrhinotermes* sind die Flügelscheiden der Nymphen hinten mit ihren Spitzen verwachsen, ein Verhältnis, das sonst, wie ich weiss, nur bei *Serritermes* vorkommt.

Arrhinotermes flavus BUGN. aus Ceylon ist durch Grösse und Färbung bedeutend verschieden. Hingegen steht *Arr. inopinatus* SILV. aus den Samoa-Inseln ziemlich nahe.

Mein Material scheint anzudeuten, dass Entwicklung von ergatoiden Geschlechtstieren aus wenigstens älteren Larvenstadien möglich wäre. Interessant wäre es, wenn man die larvale Entwicklung dieser Art auf einen grossen Material studieren konnte. Ich glaube, dass eine solche Untersuchung recht viel neues und überraschenden darbieten würde.

Subfam. *Leucotermitinæ* HOLMGR.

Gattung *Leucotermes* SILV.

Leucotermes speratus (KOLBE.)

Fundort:	Amami-Ōshima,	18. Apr. 1909,	WATSE coll.
	Tokio,	6. Mai 1911,	HOZAWA coll.
	Formosa,	22. Mai 1911,	WATASÉ und HOZAWA coll.
	Idzu,	11. Apr. 1911,	HOZAWA coll.
	Formosa,	23. Mai. 1911,	HOZAWA coll.
	Formosa,		OSHIMA coll.

Botel-tobago, 15. Juni 1911, HOZAWA coll.

Bemerkung: *Leucotermes speratus* ist als Imago von allen übrigen bisjetzt beschriebenen *Leucotermes*-Arten an dem hellgelben Pronotum sogleich zu trennen. Er gehört sonst der Gruppe von dunkelgefärbten *Leucotermes*-Arten, welche nur in relativ nördlichen Klima vorkommen. Hierzu gehören ausserdem: *L. lucifugus* ROSS, *L. flavipes* KOLLAR und *L. virginicus* BANKS, welche alle vorliegen. Zur Unterscheidung dieser Arten teile ich hier ein Schema mit.

Imagines.

A. Pronotum hellgelb. Flügelretikulation sehr kräftig.

L. speratus KOLBE.

B. Pronotum von derselben Farbe wie der Kopf, braunschwarz.

a. Antennen 16-gliedrig. Länge mit Flügeln 7-7.5 mm.

L. virginicus BANKS.

aa. Antennen 17-gliedrig. Länge mit Flügeln 9-12 mm.

b. Länge mit Flügeln 9 mm. Schienen immer weissgelblich. Fühler gegen die Spitze hin dicker. Ocellen von den Augen um mehr als ihren Durchmesser entfernt.

L. flavipes KOLLAR.

bb. Länge mit Flügeln 11-12 mm. Schienen immer bräunlich angehaucht, bis braun. Fühler gleich von der Basis an dicker. Ocellen von den Augen kaum um ihren Durchmesser entfernt.

L. lucifugus ROSSI.

Soldaten.

A. Vorderkopf stark aufgetrieben, sich über die Niveau des übrigen Kopfes erhebend. Vorderkopfrinne tief.

- a.* Kleiner: Länge des Kopfes mit Kiefern 2.66 mm. Breite des Kopfes 1.11 mm. Breite des Pronotums 0.78 mm. Kopf bisweilen nach vorn sehr schwach verschmälert.

L. speratus KOLBE.

- aa.* Grösser: Länge des Kopfes 2.85 mm. Breite des Kopfes 1.22 mm. Breite des Pronotums 0.92 mm. Kopf nach vorn nicht verschmälert.

L. flavipes KOLLAR.

- B.* Vorderkopf sich kaum über die Niveau des übrigen Kopfes hehend. Vorderkopfrinne seicht.

- a.* Oberlippe oval, mit abgerundeter Spitze. Kopflänge 2.48 mm. Kopfbreite 1 mm. Breite des Pronotums 0.78 mm.

L. virginicus BANKS.

- aa.* Oberlippe dreieckig, zugespitzt. Kopflänge 2.4 mm. Kopfbreite 1.11 mm. Breite des Pronotums 0.81 mm.

L. lucifugus ROSSI

Wie aus dieser Übersicht hervorgeht, sind die Soldaten dieser vier Arten einander äusserst ähnlich, und die Unterscheidung derselben, ohne zugehörigen Imagines, muss deshalb als sehr misslich betrachtet werden. Angaben von Funden von Soldaten, wo Imagines nicht gleichzeitig vorhanden sind, z. B. von *L. flavipes* ausserhalb Amerika z. B. in Japan, müssen deshalb als recht zweifelhaft angesehen werden.

In den obigen Übersichten fehlt "*Leucotermes vilis* (HAV.)," eine Art, welche ich, DESNEUX folgend und ohne eigene Kenntnis, als ein *Leucotermes* aufgefasst habe. Nach dem ich aber nun Exemplare dieser Termiten untersucht habe, finde ich, dass sie gar keine *Leucotermes*-Art ist. "*Termes vilis* HAV." steht "*Eutermes desertorum* DESN." aus Afrika am nächsten und repräsentiert wahrscheinlich eine neue Gattung, welche in der Nähe von *Hamitermes* SILV. steht.

Fam. *Metatermitidæ* HOLMGR.

Termes-Reihe.

Gattung *Odontotermes* HOLMGR.*Odontotermes formosanus*, n. sp.

Imago: Kopf schwarzbraun, Körper etwas heller. Umgebung der Fontanelle, Vorderrand des Transversalbandes, Antennenflecken, Clypeobasale, Mundteile, Antennen, T-Zeichnung und Schulterflecken des Pronotums und Unterseite gelblich. Abdominalsternite doch grau-gelblich. Flügel gelblich-schwarzbraun.

Behaarung dicht, gelbbraun.

Kopf breit oval, nach vorn verschmälert. Augen ziemlich klein, ausstehend. Ocellen mittelgross bis klein, meistens um mehr als ihren Durchmesser von den Augen entfernt. Fontanelle erhaben. Transversalband beiderseits der Mittellinie etwas eingedrückt. Clypeobasale den Mandibelkondylen erreichend, hellgelb, vorn ausgerandet, (relativ) kurz, flach gewölbt, braun behaart. Antennen 19-gliedrig. 2. Glied viel länger als 3.; 3. so lang wie 4.; 5. unbedeutend kürzer.

Pronotum wie bei *O. sinensis*. Mesonotum etwas tiefer ausgeschnitten als Metanotum.

Länge mit Flügeln	26-30 mm.
„ ohne „	11-13 „
„ der Vorderflügel	22-25 „
Kopflänge	2.77 „
Kopfbreite	2.55 „
Breite des Pronotums	2.33 „
Länge „ „ „	1.15 „

Königin: Eine junge Königin liegt vor. Die Körperseiten sind warzig fein pigmentiert.

Soldat: Dem nahestehenden *Odontotermes assamensis* n. sp. äus-

serst ähnlich, und sogar kaum von dieser Art mit vollständiger Sicherheit zu trennen. Die Kopfseiten sind aber bei *O. assamensis* bogenförmig nach vorn deutlich konvergierend, bei *O. formosanus* hingegen gerade und nach vorn nur sehr schwach konvergierend.

Kopf rotgelb-braun. Körper weissgelblich mit weissen Flecken und durchschimmernden Darminhalt.

Kopf nach vorn nur wenig verschmälert, parallelseitig. Fontanel-
len nicht sichtbar. Oberlippe zungenförmig, vorn abgerundet. Linker
Oberkiefer mit einem scharfen Zahn ausserhalb der Mitte. Rechter
Kiefer mit einem äusserst schwachen Zahn ausserhalb der Mitte.
Antennen 16-17-gliedrig. 2. Glied so lang wie 3. und 4. zusammen-
genommen (bei *assamensis* gewöhnlich kürzer als 3. und 4.).

Pronotum vorn deutlich ausgeschnitten (bei *assamensis* nur sehr
schwach).

	<i>O. formosanus</i>	<i>O. assamensis</i>
Körperlänge	4.2-6. mm.	4.2 mm.
Kopflänge mit Oberkiefern...	2.1-2.26 „	2.18 „
„ ohne „ ..	1.41-1.59 „	1.41 „
Kopfbreite	1.15-1.22 „	1.11 „
Breite des Pronotums	0.81-0.85 „	0.85 „

Arbeiter (zwei Grossen): Kopf gelb, Körper weisslich.

Behaarung ziemlich dicht.

Kopf breit oval, Kopfnähte nicht sichtbar. Fontanelle undeutlich.
Clypeus recht flach, kürzer als seine halbe Breite. Mundpartie ziem-
lich ausgezogen, Oberlippe wenig stark geneigt. Antennen 17-gliedrig.
2. Glied so lang wie 3. und 4. zusammengenommen; 4. etwas länger
als 3.; 5. so lang wie 3. (bei den kleinern Arbeitern ist 2. Glied so
lang wie die drei folgenden zusammengenommen).

Pronotum vorn etwas ausgeschnitten. Hinterleib ziemlich dick,
gewölbt.

Körperlänge	5 mm.	4 mm.
Kopflänge	1.95 „	1.18 „

Kopfbreite 1.44 mm. 0.92 mm.

Breite des Pronotums 0.81 „ 0.63 „

Fundort: Formosa, 7. Mai 1911; WATASE, HOZAWA und YASUDA coll.

Tamsui, HIRTH coll, Museum Wien ;

Hongkong, RANSONÉT coll., „ „ ;

Siam (Bangkok), „ „ „ „ ;

China, Canton und Futschau, (Prov. FOKIEN), Hamburg.

Bemerkung: Betreffs der Imagines ist diese Art mit *O. dives*, *O. javanicus*, n. sp., *O. Buitenzorgi* am nächsten verwandt. Von *O. dives* unterscheiden sie sich leicht an der haarigen Stirn. *O. javanicus* ist nur wenig verschieden. Der gelbe Vorderteil des Transversalbandes (bei *O. formosanus* sind nur die Vorderecken hell gelb), die wenig erhabenen Innenränder der Ocellen und die nicht flachgedrückte Stirn unterscheidet *O. javanicus* von *O. formosanus*. Ebenso ist *O. formosanus* viel dunkler gefärbt mit schwarzbraunen Flügeln. *O. Buitenzorgi* besitzt in den grossen Mandibelkondylen eine Eigenschaft, welche sie von *O. formosanus* sofort unterscheidet.

Von *O. assamensis*, dessen Soldaten und Arbeiter kaum von *O. formosanus* unterschieden werden können, ist *O. formosanus* als Imago sehr verschieden. *O. assamensis* (Imago) ist viel grösser (Breite des Kopfes 2.76 mm., Breite des Pronotums 2.62 mm.). Die Ocellen liegen bei *O. assamensis* nur um ihren kürzeren Durchmesser von den Augen entfernt (bei *formosanus* sind die Ocellen viel weiter von den Augen getrennt). *O. formosanus* ist vier dunkler gefärbt. Die Soldaten und Arbeiter von *O. formosanus* sind von denjenigen von *O. assamensis* kaum verschieden und erinnern uns auch sehr an *O. obesus* und *O. Redemanni*, aber die Lage der linken Mandibelzahn unterscheiden diese letzteren von den ersten.

Mirotermes-Reihe.

Gattung *Capritermes* WASM.*Capritermes sulcatus*, n. sp.

Imago: Kopf dunkelbraun; Clypeus gelblich; Antennen braun, hell geringelt. Pronotum heller als der Kopf, mit gelblicher T-förmiger Zeichnung. Meso- und Metanotum gelblich. Abdominaltergite braun. Sternite besonders in der Mitte heller. Flügel dunkel. Mit braunschwarzen vorderen Rippen. Übrige Rippen auch deutlich.

Kopf und Pronotum ziemlich dicht und etwas anliegend weisslichgelb behaart.

Kopf breitoval, nach vorn verschmälert. Facettenaugen ziemlich klein, etwas ausstehend. Ocellen nach seitwärts blickend, von den Augen um etwas weniger als ihren Durchmesser entfernt. Fontanelle recht gross, oval, weiss, stark eingegraben in einer recht tiefen nach vorne zweigeteilten Grube gelegen. Clypeobasale kürzer als seine halbe Breite, flach. Erster Zahn der Oberkiefer kaum grösser als 2. oder wenigstens nicht viel grösser. Antennen 15-gliedrig. 2. Glied etwas kürzer als 3. und 4. zusammengenommen; 3. Glied kürzer als 4.

Pronotum klein mit nach hinten stark konvergierenden Seiten, vorn in der Mitte schwach eingeschnitten, hinten recht deutlich ausgerandet. Mesonotum hinten etwas tiefer eingeschnitten als Metanotum. Flügelmembran dicht und fein bestachelt ("punktiert"). Von dem Basalteil des Radiussectors gehen einige schwach rückläufige Rippen aus. Mediana mit 2-3 Zweigen, Cubitus mit 7-8.

Länge mit Flügeln	12.2	mm.
„ ohne „	8	„
„ der Vorderflügeln	10.3	„
„ des Kopfes	1.15	„
Breite „ „	1.07	„
Länge des Pronotums	0.52	„

Breite „ „ 0.81 mm.

Soldat: Kopf hellgelb-rotbraun oder gelbbrot, in letztem Falle nach vorn deutlich gebräunt. Körper strohgelb oder mit schwach gebräunten Tergiten.

Kopf mit einigen Borsten besetzt. Abdominalplatten kurz behaart, mit einer hinteren Borstenreihe.

Kopf langgestreckt, rectangulär, etwa doppelt länger als breit. Sagittalnaht rinnenförmig, bei den ausgefärbten Exemplaren von einer scharfen schwarzen Linie markiert, welche die Fontanelle nicht ganz erreicht. Fontanelle klein, offen, mit Fontanellendrüse. Clypeobasale sehr schmal. Oberlippe relativ kurz, an der Spitze nicht besonders tief ausgeschnitten, Zinken der Oberlippe kurz. Linker Mandibel stark gekrümmt, rechter relativ gerade. Antennen 14-gliedrig. 3. Glied etwas länger als 2.; 4. kürzer als 2.; 5. etwas länger als 3.

Pronotum sattelförmig, vorn sehr schwach ausgeschnitten.

Körperlänge	6	mm.
Kopflänge mit Oberkiefern	3.7	„
„ ohne „	2.07-2.29	„
Kopfbreite	1.11	„
Breite des Pronotums	0.67-0.89	„

Arbeiter: Weisslich.

Kopf dünn behaart, Körper dichter.

Kopf etwas pentagonal abgerundet. Clypeobasale etwas kürzer als seine halbe Breite, etwas aufgetrieben, hinten schwach konvex, vorn gerade begrenzt. Antennen 14-gliedrig. 2. Glied etwa so lang wie 3. und 4. zusammengenommen.

Pronotum sattelförmig, vorn nicht ausgerandet.

Caprit. sulcatus *Caprit. nemorosus.*

Körperlänge	(4)-4.5 mm.	4 mm.
Kopflänge	1.11 „	1.07 „
Kopfbreite	0.89 „	0.81 „

Breite des Pronotums 0.55 „ 0.52 mm.

Fundort: Formosa. 23. Mai und 3. Juni 1911, HOZAWA coll.

Bemerkung: Diese Art steht *Capritermes nemorosus* nahe, ist aber grösser. Sie unterscheidet sich im Imagozustand ausserdem an den 15-gliedrigen Fühlern (*C. nemorosus* besitzt 14-gliedrigen), deren 3. Glied sehr kurz ist (bei *C. nemorosus* länger als 2.), an der grossen länglichen Fontanelle (bei *C. nemorosus* kaum sichtbar), und an der dunkleren Färbung.

Als Soldat unterscheidet sich *Capritermes sulcatus* von *C. nemorosus* an den tief gerinten Kopf, an der kürzeren, weniger tief ausgeschnittenen Oberlippe, deren Zinken kürzer sind als bei *C. nemorosus* in welchem die lange Oberlippe relativ langen Zinken besitzt.

Die Arbeiter unterscheiden sich hauptsächlich in der Grösse. Siehe oben! Ausserdem ist bei *C. nemorosus* das Clypeobasale oft vorn etwas konkav begrenzt, und der Kopf etwas mehr gerundet.

Syntermes-Reihe.

Gattung *Eutermes* MÜLL.

Untergattung *Eutermes* s. st. HOLMGR.

Eutermes (Eutermes) piciceps n. sp.

Imago: Kopf dunkelbraun, mit rostgelben Clypeobasale und Antennen, bisweilen auch mit ebenso gefärbtem Vorderteil des Transversalbandes. Pronotum, Meso- und Metanotum rostgelb-hellgelb, etwas gebräunt. Abdominaltergite braun, Sternite viel heller-rostgelb, in der Mitte noch heller. Bein rostgelb. Flügel gelbbraun, mit dunkelbraunen Rippen.

Behaarung dicht, etwas gelblich.

Kopf sehr breit, etwa so breit wie lang oder sogar etwas breiter. Facettenaugen sehr gross, Ocellen ziemlich gross, von den Augen nur wenig getrennt, Innenrand stark aufgehoben, so dass ein Querwall

zwischen den Ocellen entsteht. Fontanelle klein, spaltförmig. Umgebung derselben in weitem Umkreis eingedrückt. Clypeobasale sehr kurz, viel kürzer als seine halbe Breite. Antennen 15–16-gliedrig. 15-gliedrig: 2. Glied so lang wie 3.; 4. kürzer als 2. 16-gliedrig: 3. Glied viel kürzer als 2. und kürzer als 4., welches etwas kürzer ist als 2.

Pronotum schmaler als der Kopf, vorn und hinten nur sehr wenig eingeschnitten. Mesonotum hinten breit aber sehr seicht ausgerandet. Metanotum hinten beinahe gerade. Zwischen der Mediana und dem Radiussector können rücklaufende Radiussectorzweige vorkommen oder fehlen. Ein Subcostalstrich ist öfters vorhanden. Die Mediana besitzt 1-2-3 Spitzenzweigen und auch oft kurze vordere Querzweige welche gegen dem Radiussector verlaufen. Cubitus mit ca. 10–11 Zweigen, von denen die 6–7 inneren dichter sind als die übrigen.

Länge mit Flügeln	15	mm.
„ ohne „	7-7.5	„
„ der Vorderflügel	12.3	„
Kopflänge	1.52	„
Kopfbreite	1.55	„
Länge des Pronotums	0.74	„
Breite „ „	1.22	„

Soldat: Kopf schwarzbraun. Körper rostgelb-rostbraun.

Kopf mit nur einigen Borsten. Abdominaltergite glatt, mit Borsten nur am Hinterrande.

Kopf beinahe kreisrund, nach vorn gegen der Nasenbasis allmählich verschmälert. Nase kegelförmig. Stirnprofil vollständig gerade. Antennen meistens 14-gliedrig. 3. Glied kürzer als 2.; 4. so lang wie 2.; 5. etwa wie 4.; übrige Glieder allmählich länger.

Pronotum nicht besonders tief sattelförmig; Vorderrand ohne oder mit einer schwachen Einschnitt.

Körperlänge	3.7	mm.
Kopflänge	1.7	„
Kopfbreite	1.11	„

Länge der Nase 0.78 mm.

Breite des Pronotums 0.63 „

Arbeiter (zwei grosse): Kopf braun mit hellen Kopfnähte, Antennen rostgelblich. Körper rostgelb-rostbräunlich.

Behaarung ziemlich dünn.

Kopf breit oval. Kopfnähte sehr deutlich, weisslich. Transversalband etwas (unbedeutend) heller als der Kopf. Clypeobasale (sehr) klein. Antennen bei dem grösseren Arbeiter schmal, 15-gliedrig. 3. Glied kürzer als 2. und etwa so lang wie 4. Bei den kleineren Arbeitern sind die Antennen 14-gliedrig. 3. Glied kürzer als 2.; 4. kürzer als 3.

Pronotum bei den grösseren Arbeitern vorn deutlich ausgeschnitten, bei den kleineren nicht eingeschnitten.

Kleiner Arbeiter. Grosser Arbeiter.

Körperlänge 3.5 mm. 5-5.5 mm.

Kopfbreite 1.07 „ 1.48 „

Breite des Pronotums .. 0.63 „ 0.89 „

Fundort; Formosa. 29 April, 1911, INAMURA coll.;

Botel-tobago, HOZAWA coll. ; Christmas Island, Museum
Wien.

Bemerkung; Diese Art steht dem *Eutermes piciceps* von den Christmas Inseln so äusserst nahe, dass ich es nicht für berechtigt halte sie zu unterscheiden. Bei der Imago sind die Facettenaugen der Formosastücke vielleicht etwas grösser, und der Kopf ist auch etwas breiter. (Bei den Christmas Inseln Exemplaren 2.48 mm.). Die Soldaten stimmen vollständig überein. Bei den Formosa Exemplaren können sie etwas dunkler sein als bei den Christmas-Island Exemplaren.

***Eutermes (Eutermes) Watasei* n. sp.**

Imago: Kopf braun, Clypeus hellgelb. Pronotum etwas heller als der Kopf, mit eingedrückter, undeutlicher T-förmiger Zeichnung. Vorderteil der Pterothoraxnota hellgelb. Abdominaltergite braun,

Sternite besonders in der Mitte heller. Tibien gebräunt. Flügel schwarzbraun mit schwarzen Rippen. Zwischen Mediana und Cubitus weisslich.

Behaarung ziemlich dicht.

Kopf breit oval, nach vorn etwas verschmälert. Augen klein, etwas ausstehend. Ocellen mittelgross, seitwärts blickend, von den Augen um ihren Durchmesser entfernt. Stirn flach eingedrückt. Fontanelle punktförmig-spaltförmig. Clypeobasale (viel) kürzer als seine halbe Breite, flach gewölbt. Erster Zahn der Oberkiefer nicht länger als 2. Antennen 15-gliedrig. 3. Glied viel kürzer als 2.; 4. etwas kürzer als 2.; 5. so lang wie 4., kugelförmig; folgende Glieder allmählig länger.

Pronotum etwas schmaler als der Kopf; vorn kaum, hinten ziemlich deutlich eingeschnitten. Seiten nach hinten ziemlich stark konvergierend. Mesonotum etwas breiter ausgeschnitten als Metanotum, mit abgerundeten Hinterecken. Flügel dicht "punktiert", gleichbreit. Mediana mit 2-3 Zweigen, Cubitus mit 9-10, von denen die etwa 5 inneren dicker sind.

Länge mit Flügeln	11.5 mm.
„ ohne „	5.5-6 „
„ der Vorderflügel	9 „
Kopflänge	1.22 „
Kopfbreite	1.11 „
Länge des Pronotums	0.55 „
Breite „ „	0.92 „

Soldat: Kopf hellgelb mit gebräunter Nase, Körper gelblich weiss, mit gelblichen Tergiten.

Kopf mit beinahe mikroskopischen Haaren dünn bekleidet, und ausserdem mit einigen längeren Borsten. Abdominalplatten dünn, kurzhaarig, mit längeren Haaren am Hinterrande.

Kopf oval, nach vorn verschmälert. Nase lang, cylindrisch, etwa so lang wie der Kopf im übrigen. Ausführungsgang der Frontaldrüse

braun durchscheinend. Kopfprofil gerade, mit einer beinahe unmerklichen Einsenkung hinter der Nasenwurzel. Antennen 12-13-gliedrig. 12-gliedrig: 3. Glied etwas kürzer als 2.; 4. etwas länger als 2. 13-gliedrig: 4. Glied in zwei kurzen Glieder geteilt, von denen das 2 (-5. der Antenne) so lang ist wie das 3. der Antennen.

Pronotum sattelförmig, vorne nicht eingeschnitten.

Körperlänge	3.5-4 mm.
Kopflänge	1.41 „
Kopfbreite	0.74 „
Länge der Nase	0.67 „ ¹⁾
Breite des Pronotums	0.37 „

Arbeiter: Kopf gelblich. Körper weisslich, mit durchschimmerndem Darminhalt.

Kopf kurzhaarig und mit längeren Haaren. Behaarung im übrigen wie bei den Soldaten.

Kopf beinahe kreisrund. Kopfnähte undeutlich. Fontanelle ziemlich gross, eingedrückt. Clypeobasale kürzer als seine Breite. Antennen 14-gliedrig. 2. Glied so lang wie 3. und 4. zusammengenommen; 3. etwas länger als 4.; 5. länger und dichter als 4.

Pronotum sattelförmig, vorn nicht eingeschnitten.

Körperlänge	4-4.25 mm.
Kopfbreite	0.92 „
Breite des Pronotums	0.52 „

Fundort: Formosa. HOZAWA coll., Imagines (23. Mai, 2. Juni 1911), Soldaten und Arbeiter.

1) Von der Querlinie zwischen den Vorderrändern der Antennenhöhlen gerechnet.

A Hand-List of Formosan Birds.

By

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The following list was originally compiled for my own use in the study of Formosan avifauna. On recommendation of Professor Ijima, it is now published with the aim of giving a handy guide to the collectors and students of the birds of that interesting island, and eventually of aiding in the furtherance of our knowledge about them. It scarcely needs to be mentioned that the list is largely based on the previous records, but I should state that not a small part of my labour consisted in the study of the collections of the Science College, Tokyo Imperial University, and of the Taihoku Museum, Formosa. It may here be mentioned that the Science College collection of Formosan birds, which originally consisted of the skins obtained by Mr. Tada in 1896-1897, has of recent years undergone much augmentation from donations by Mr. A. Owston of Yokohama and by Mr. Y. Kikuchi of the Taihoku Museum.

In the last published important work on Formosan birds—that of Ogilvie Grant and La Touche (1907)—there were given 260 species as known from the island. Overlooked in that work but previously reported from the island were 5 species (viz., *Bulweria bulweri* mentioned by Ogawa 1906; *Cuculus canorus*, *Tringa subarquata*, *Nycticorax prasinosceles* and *Larus vegæ* contained in Tada 1898); while subsequently new additions were made: by Grant (1908) 3 species (viz., *Pyrrhula owstoni*, *Hemichelidon ferruginea* and *Syrnium nivicola*) and by Hartert (1905) 1 species (viz., *Alauda coelivox*). Now

in the present list, still 21 more are added,—all which I have indicated in the list by affixing asterisk to the names—bringing the total number of bird species known from that island up to 290. So far as I can judge, none of the added species are new, but are forms that have been known from either the adjacent parts of the continent or from neighbouring islands on the north or south. The discovery of *Dicaeum* *sp.* has introduced a new family, the Dicaeidae, to the ornithology of the island.

Japanese names proposed for the first time in this paper are also marked with asterisk.

A list of the literature relating to Formosan birds is appended below.

1. R. Swinhoe: Further corrections and additions to the "Ornithology of Amoy," with some remarks on the birds of Formosa. *Ibis*, 1860, pp. 357-361.
2. J. Gould: Descriptions of sixteen new species of birds from the island of Formosa, collected by Robert Swinhoe. *Proc. Zool. Soc.*, 1862, pp. 280-286.
3. R. Swinhoe: The ornithology of Formosa or Taiwan. *Ibis*, 1863, pp. 198-219, 250-311, 377-435.
4. R. Swinhoe: Descriptions of new species of Formosan birds with further notes on the ornithology of the islands. *Ibis*, 1864, pp. 361-370, 423-428; 1866, pp. 129-138, 292-316, 392-406.
5. R. Swinhoe: Birds and beasts of Formosa. *Shanghai Journal*, 1865, pp. 39-52; *Wien Zool. Bot. Verhandl.*, 1866, pp. 438-447.
6. R. Swinhoe: Descriptions of three new Formosan birds. *Ibis*, 1866, pp. 108-112.
7. R. Swinhoe: Descriptions of three new Formosan birds. *Ibis*, 1866, pp. 351-358.
8. R. Swinhoe: Descriptions of two new Formosan birds. *Ibis*,

1866, pp. 543-546.

9. D. G. Elliot: *Proc. Zool. Soc.*, 1870, pp. 406-407.
10. R. Swinhoe: A revised catalogue of the birds of China and its islands. *Proc. Zool. Soc.*, 1871, pp. 337-423.
11. H. J. Elwes: On the geographical distribution of asiatic birds. *Proc. Zool. Soc.*, 1873, pp. 645-682.
12. Catalogue of the birds in the British Museum. 1874-1898.
13. A. David et E. Oustalet: *Oiseaux de la Chine*. 1877.
14. J. Gould: *Birds of Asia*. 1850-1883.
15. W. R. Ogilvie Grant: *Ibis*, 1889, pp. 54-58.
16. F. W. Styan: *Ibis*, 1893, p. 470.
17. F. W. Styan: Notes on the ornithology of China. *Ibis*, 1894, p. 337, pl. IX.
18. "Teikoku Shinryōchi Taiwan Dōbutsu Ihō." (The fauna of the Formosan Island.) "*Dōbutsu-gaku Zasshi*," 1895, pp. 265-298.
19. H. Seebohm: On some new and little known species of birds from Formosa. *Ibis*, 1895, pp. 211-213, pl. VI.
20. J. D. D. La Touche: Notes on South Formosa and its birds. *Ibis*, 1895, pp. 305-338.
21. J. D. D. La Touche: Notes on birds of northern Formosa. *Ibis*, 1898, pp. 356-373.
22. K. Tada; "Taiwan Chōrui Ippan" (a sketch of Formosan birds.) 1898.
23. C. E. Hellmayr: *Das Tierreich*; *Paridæ*, *Sittidæ* und *Certhiidæ*. 1903.
24. E. Hartert: *Die Vögel der Paläarktischen Fauna*. 1903-1910.
25. M. Ogawa: "Menkatō nite etaru sooshuno Chōrui." (On some birds from Crag Island, Formosa.) "*Dōbutsugaku Zasshi*." 1906, pp. 125-131.
26. W. R. Ogilvie Grant: *Bull. British Ornith. Club*. 1906, Oct., pp. 118-122.

27. R. C. McGregor and D. C. Worcester : A hand-list of the birds of the Philippine Islands. 1906.
 28. R. C. McGregor : The birds of Batan, Camigin &c. Phil. Journ. Sci. 1907, pp. 337-349, pl. I-III.
 29. W. R. Ogilvie Grant and J. D. D. La Touche : On the birds of the Island of Formosa. Ibis, 1907, pp. 151-198, 254-279.
 30. Hon. Walter Rothschild : Bull. British Ornith. Club, 1907, Oct., pp. 9-10.
 31. W. R. Ogilvie Grant : Additional notes on the birds of Formosa, 1908, pp. 600-608.
 32. R. C. McGregor : A manual of Philippine birds 1909.
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Order COLYMBIFORMES.

Suborder COLYMBI.

Family COLYMBIDÆ.

1. **Colymbus septentrionalis** L... .. *Abi*.
Grant and La Touche, Ibis, 1907, p. 271.

Suborder PODICIPEDES.

Family PODICIPEDIDÆ.

2. **Podiceps philippensis** Bonn. *Kaitsuburi*.
Swinhoe, P. Z. S., 1871, p. 415; Grant, Cat. B. Br. Mus., XXVI,
p. 511; Tada, Taiwan Chōrui Ippan, 1899, p. 91; Grant and La
Touche, Ibis, 1907, p. 272; Grant, Ibis, 1908, p. 606; *Podiceps minor*
(Gmel.), Tada, Taiwan Chōrui Ippan, p. 90.

Specimens from :

Suisha (Nantō Distr.), Oct. 10, 29.

Harōei (Taitō Distr.), Sept. 3.

Shūshū (Nantō Distr.), Jan. 6.

Rantaisan (Nantō Distr.), March 19.

Order PROCELLARIIFORMES.

Suborder TUBINARES.

Family PROCELLARIIDÆ.

Subfamily Diomedeinæ.

3. **Diomedea albatrus** Pall. *Ahōdori*.
Tada, Taiwan Chōrui Ippan, p. 80; Grant and La Touche, Ibis,
1907, p. 271.

Specimens from :

Formosan Channel.

Pescadores Ils.

4. **Diomedea nigripes** Aud... .. *Kuro-ahōdori*.

Tada, Taiwan Chōrui Ippan, p. 80; Grant and La Touche, Ibis, 1907, p. 271.

Specimens from :

Formosan Channel.

Pescadores Ils.

Subfamily Procellariinæ.

5. **Oceanodroma monorhis** (Swinh.). **Hime-seguro-umitsubame*.

Grant and La Touche, Ibis, 1907, p. 271; *Thalassidroma monorhis* Swinh., P. Z. S., 1871, p. 422.

Obtained in N. E. Formosa.

6. **Bulweria bulweri** (Jard. & Sel.) *Anadori*.

Ogawa, Dōbutsugaku Zasshi (Tokyo Zoological Magazine), 1904, p. 130.

Specimens from :

Horisha (Nantō Distr.), January 16.

Menkatō (Crag) (Kiirun Distr.), July.

*7. **Puffinus leucomelas** (Temm.) *Ōmizunagidori*.

*8. **Puffinus cuneatus** Salv. *Onaga-mizunagidori*.

Obtained in Pescadores Ils., May 15.

Order CICONIIFORMES.

Suborder STEGANOPODES.

Family SULIDÆ

9. **Sula sula** (L.) *Ruikiu-Katsuodori*.

Grant, Cat. B. Br. Mus., XXVI, p. 436; Grant and La Touch Ibis, 1907, p. 259; *Sula fiber* (L.), Swinhoc, P. Z. S., 1871, p. 420.

Specimens from :

Tansui (Taihoku Distr.).

Bratas IIs., June 15.

Family **PHALACROCORACIDÆ**.

10. **Phalacrocorax carbo** (L.) *Uni-u.*

Swinhoe, P. Z. S., 1871, p. 420; Grant and La Touche, Ibis, 1907,

p. 259.

Obtained in Kishitō, Horisha (Nantō Distr.), May.

11. **Phalacrocorax bicristatus** Pallas. *Chishima-ngarasu.*

Grant and La Touche, Ibis, 1907, p. 259.

Obtained in North coast of Formosa.

Family **FREGATIDÆ**.

*12. **Fregata minor** (Gmel.). **Momojiro-guukandori.*

Suborder **ARDEÆ**.

Family **ARDEIDÆ**.

13. **Ardea cinerea** L. *Aosagi.*

Swinhoe, P. Z. S., 1871, p. 411; La Touche, Ibis, 1895, p. 306;

Tada, Taiwan Chōrui Ippan, p. 76; Grant and La Touche, Ibis, 1907,

p. 262.

Specimens from :

Anpin (Tainan Distr.), Nov. 1.

Hakusatan, Hōzan (Hōzan Distr.), Jan. 9

14. **Ardea coromanda** (Bodd.). *Amasagi.*

Tada, Taiwan Chōrui Ippan, p. 75; *Bubulucus colomandus*

(Bodd.), Swinhoe, P. Z. S., 1871, p. 412; Grant and La Touche, Ibis,

1907, p. 263.

Specimens from :

Sankōshō (Kagi Distr.), July 15.

Taikiuyen (Kagi Distr.), July 23 and 30.

Suikuttō (Kagi Distr.), May 27.

Taihoku (Taihoku Distr.).

Hasshiran (Taihoku Distr.), Sept. 2.

Tansui (Taihoku Distr.), Sept. 9.

Kōtōsho (Botel Tabago), May.

15. **Herodias eulophotes** Swinhoe. *Kurosagi*.

Tada, Taiwan Chōrui Ippan, p. 77; Grant and La Touche, Ibis, 1907, p. 262; *Garzetta culophotes* (Swinh.), P. Z. S., 1871, p. 412.

Specimens from :

Nanwan (Kōshun Distr.), July 21.

Kōtōsho (Botel Tabago), Jan. 10.

Pescadores IIs.

16. **Ardea garzetta** L. *Shirasagi*.

La Touche, Ibis, 1895, p. 306; Tada, Taiwan Chōrui Ippan, p. 76; *Garzetta egretta* (Brisson), Swinhoe, P. Z. S., 1871, p. 412; *Herodias garzetta* (L.), Grant and La Touche, Ibis, 1907, p. 262.

Specimens from :

Shisangan (Taihoku Distr.), July.

Hasshiran (Taihoku Distr.), Sept. 1.

Kwarenkō (Taitō Distr.), Sept. 24.

Sankōshō (Kagi Distr.), July 15.

Taiyo (Junk) (Pescadores IIs.), March.

*?17. **Ardea intermedia** Wagler *Chūsagi*.

18. **Ardetta sinensis** (Gmel.). *Yoshigoi*.

Swinhoe, P. Z. S., 1871, p. 414; Grant and La Touche, Ibis, 1907, p. 263; *Botaurus sinensis* (Gmel.), Tada, Taiwan Chōrui Ippan, p. 77.

Obtained in Tansui (Taihoku Distr.), Aug. 29 and Sept. 9.

*19. **Botaurus stellaris** (L.). *Sankanogoi*.

Specimens from :

Chikushikō (Hōzan Distr.), Sept. 7.

Taihoku (Taihoku Distr.), May.

20. **Gorsachius goisagi** (Temm.). *Mizogoi*.

Grant and La Touche, Ibis, 1907, p. 262.

21. **Gorsachius melanolophus** (Raffl.). **Taiwan-mizogoi*.

Swinhoe, P. Z. S., 1871, p. 413; Grant and La Touche, Ibis, 1907, p. 262.

*22. **Phonyx manillensis** (Meyen) *Murasaki-sagi*.

Obtained in Chikukō (Tainan Distr.), May.

23. **Herodias alba** (L.). *Daisagi*.

Grant and La Touche, Ibis, 1907, p. 262; *Egretta modesta* (Gray), Swinhoe, P. Z. S., 1871, p. 412; *Ardea alba* L., La Touche, Ibis, 1895, p. 306.

Obtained in Anpin (Tainan Distr.), Nov. 1.

24. **Ardetta cinnamomea** (Gmel.). **Akabane-yoshigoi*.

Swinhoe, P. Z. S., 1871, p. 413; Grant and La Touche, Ibis, 1907, p. 263.

Obtained in Basshishō (Taitō Distr.), Oct. 24.

25. **Nycticorax nycticorax** (L.). *Goisagi*.

Swinhoe, P. Z. S., 1871, p. 413; Tada, Taiwan Chōrui Ippan, p. 77; Grant and La Touche, Ibis, 1907, p. 263; Grant, op. cit., 1908, p. 606.

Specimens from:

Sankōshō (Kagi Distr.), July 8.

Taikiuyen (Kagi Distr.), Aug. 4.

Sanshiten (Kagi Distr.), June 1.

Hasshirin (Taihoku Distr.), Aug. 26.

Hasshiran (Taihoku Distr.), Sept. 7.

Shisangan (Taihoku Distr.), Sept. 26.

Rantaisan (Nantō Distr.).

Taitokōshō, Oct. 22.

26. **Butorides javanica** (Horsf.). *Sasagoi*.

Grant and La Touche, Ibis, 1909, p. 263; Grant, op. cit., 1908, p. 606; *Butorides macrorhynchus* Gould, Swinhoe, P. Z. S., 1871, p. 413.

Specimens from:

Sanshiten (Kagi Distr.), July 19 and Oct. 20.

Rantaisan (Nantō Distr.).

Rokumasan (Toroku Distr.), Sept. 21.

Shamikisha, April 4.

Tenchūkagai, Oct. 13.

27. **Nycticorax prasinosceles** (Swinh.) *Akagashirasagi*.

Tada, Taiwan Chōrui Ippan, p. 78.

Obtained in Taihoku (Taihoku Distr.), July 29.

28. **Dupetor flavicollis** (Lath.) **Takasago-kurosagi*.

Grant and La Touche, Ibis, 1907, p. 264.

Suborder CICONIÆ.

Family IBIDIDÆ.

Subfamily Ibidinæ.

29. **Ibis nippon** Temm. *Toki*.

Grant and La Touche, Ibis, 1907, p. 261.

Obtained in Tansui (Taihoku Distr.), April.

Subfamily Plataleinæ.

30. **Platalea minor** Temm. and Schl. . . . *Kurotsura-herasagi*.

Grant, Ibis, 1889, pp. 54-58; Sharpe, Cat. B. Br. Mus., XXVI, p. 50; Grant and La Touche, Ibis, 1907, p. 261.

Obtained in Taikokai (Banshoryō Distr.), Nov. 4.

31. **Platalea major** (Temm. and Schl.) *Herasagi*.

Grant, Ibis, 1889, pp. 39-47, fig. 1; *Platalea leucordia* L., Sharpe, Cat. B. Br. Mus., XXVI, p. 44.

Order ANSERIFORMES.

Suborder ANSERES.

Family ANATIDÆ.

Subfamily Anatinae.

- *32. **Anas javanica** Horsfield. *Riukiugamo.*

Obtained in Dabyō (Toroku Distr.), June 16.

33. **Anas zonorhyncha** Swinh. *Karugamo.*

Anas pœcilorhyncha Pennant, Grant and La Touche, Ibis, 1907, p. 260.

34. **Anas boschas** L. *Magamo.*

Grant and La Touche, Ibis, 1907, p. 260.

35. **Anas formosa** Georgi. *Tomoegamo.*

Nettion formosum (Georgi.), Grant and La Touche, Ibis, 1907, p. 260.

36. **Anas falcata** Georgi. *Yoshigamo.*

Eunetta falcata (Georgi), Swinhoe, P. Z. S., 1871, p. 419; Grant and La Touche, Ibis, 1907, p. 260.

37. **Æx galericulata** (L.). *Oshidori.*

Swinhoe, P.Z.S., 1871, p. 418; Salvadori Cat. B. Br. Mus., XXVII, p. 76; Grant and La Touche, Ibis, 1907, p. 260.

Specimens from:

Suishako (Nantō Distr.), Dec. 8.

Horisha (Nantō Distr.), January.

38. **Aethya fuligula** (L.)... *Kinkurohajiuro.*

Fuligula fuligula (L.), Grant and La Touche, Ibis, 1907, p. 261.

39. **Aethya marila** (L.). *Suzugamo.*

Fuligula marila (L.), Tada, Taiwan Chōrui Ippan, p. 80; Grant and La Touche, Ibis, 1907, p. 260; Falix marila (L.), Swinhoe, P. Z. S., 1871, p. 419.

40. **Clangula glaucion** (L.) *Hōjirogamo*.
Clangula clangula (L.), Grant and La Touche, Ibis, 1907, p.
 261.
41. **Dafila acuta** (L.). *Onagagamo*.
 Swinhoe, P. Z. S., 1871, p. 418; Tada, Taiwan Chōrui Ippan, p.
 79; Grant and La Touche, Ibis, 1907, p. 260.
- *42. **Oidemia fusca stejnegeri** (Ridgway). *Birōdokinkuro*.
43. **Spatula clypeata** (L.). *Hashibirogamo*.
 Swinhoe, P. Z. S., 1871, p. 418; Salvadori, Cat. B. Br. Mus., XXVII,
 p. 306; Grant and La Touche, Ibis, 1907, p. 260; *Anas clypeata* L.,
 Tada, Taiwan Chōrui Ippan, p. 78.
 Obtained in Manka (Taihoku Distr.), Feb. 20.
44. **Tadorna cornuta** (L.). *Tsukushigamo*.
 Grant and La Touche, Ibis, 1907, p. 259.
45. **Tadorna rutila** (Pall.). *Akatsukushigamo*.
Casarca casarca (L.), Grant and La Touche, Ibis, 1907, p. 259.
 Obtained in Tokō (Akō Distr.), January.
46. **Mareca penelope** (L.). *Hidorigamo*.
 Swinhoe, P. Z. S., 1871, p. 418; Salvadori, Cat. B. Br. Mus., XXVII,
 p. 227; Tada, Taiwan Chōrui Ippan, p. 79; Grant and La Touche,
 Ibis, 1907, p. 260.
47. **Nettion crecca** (L.). *Kogamo*.
 Grant and La Touche, Ibis, 1907, p. 260; *Querquedula crecca* (L.),
 Swinhoe, P. Z. S., 1871, p. 418; Tada, Taiwan Chōrui Ippan, p. 79.
 Specimens from :
 Shūshūkai (Nantō Distr.), Jan. 6.
 Suisha (Nantō Distr.), Nov. 5, Dec. 7.
48. **Querquedula circea** (L.). *Shimaaji*.
 Swinhoe, P. Z. S., 1871, p. 418; Salvadori, Cat. B. Br. Mus., XXVII,
 p. 293; *Anas circea* L., Tada, Taiwan Chōrui Ippan, p. 79; *Querque-*
dula querquedula (L.), Grant and La Touche, Ibis, 1907, p. 260.
 Obtained in Tansui (Taihoku Distr.), March 13, April 7.

Subfamily **Merginæ**.

49. **Mergus serrator** L. *Umiaisa*.
Merganser serrator (L.), Grant and La Touche, Ibis, 1907, p.
 261.

Subfamily **Anserinæ**.

- *50. **Anser albifrons** (Scop.) *Magan*.
Anser sp. inc., Grant and La Touche, Ibis, 1907, p. 259.

Order **FALCONIFORMES**.Suborder **ACCIPITRES**.Family **FALCONIDÆ**.Subfamily **Accipitrinæ**.

51. **Circus æruginosus** L. *Chūhi*
 Swinhoe, P. Z. S., 1871, p. 342; Sharpe, Cat. B. Br. Mus., i, p. 69;
 La Touche, Ibis, 1895, pp. 326, 337; La Touche, op. cit., 1898, p. 372;
 Tada, Taiwan Chōrui Ippan, p. 74; Grant and La Touche, Ibis, 1907,
 p. 256; *Circus sp. inc.*, La Touche, op. cit., 1895, pp. 326, 337.

Obtained in Taihoku (Taihoku Distr.)

52. **Circus spilonotus** Kaup. *Shiberia-Chūhi*.
 La Touche, Ibis, 1895, pp. 326, 337; La Touche, op. cit., 1898,
 p. 372; Tada, Taiwan Chōrui Ippan, p. 74; Grant and La Touche,
 Ibis, 1907, p. 256.

Obtained in Tenchūkagai, April 4.

53. **Accipiter gularis** (Temm. and Schl.) *Essai*, ♀ *Tsumi*.
 Swinhoe, P. Z. S., 1871, p. 342; Grant, Ibis, 1906, p. 104; Grant
 and La Touche, op. cit., 1904, p. 257; *Accipiter nisoides* Blyth., La
 Touche, Ibis, 1898, p. 372; *Accipiter sp.*, Tada, Taiwan Chōrui Ippan,
 p. 71, No. 121.

Specimens from :

Kwarenkō (Taitō Distr.), Sept. 26.

Hokuzan (North Hill) (Toroku Distr.), Feb. 17, April 27.

54. **Accipiter affinis** Hodgs.

Grant, Ibis, 1896, p. 107 ; Grant and La Touche, op. cit., 1907, p. 257 ; *Accipiter virgatus* (Temm.), Swinhoe, P. Z. S., 1871, p. 342 ; La Touche, Ibis, 1895, pp. 314, 337 ; Tada, Taiwan Chōrui Ippan, p. 72 ; *Accipiter sp.*, Tada, op. cit. p. 72, No. 123.

Specimens from :

Shūshū (Nantō Distr.), Jan. 24, Feb. 13.

Banshiro (Kagi Distr.), May 14.

Sanshiten (Kagi Distr.), Oct. 4.

The foot of the Daitonzan (Taihoku Distr.), Sept. 12.

Racu Racu Mt., Feb.

Tappansha, Jan. 21.

55. **Lophospiza trivirgata** (Temm.). . . . **Taiwan-Ōtaka*.

Swinhoe, P. Z. S., 1871, p. 341 ; Grant and La Touche, Ibis, 1907, p. 256 ; *Astur trivirgata* Temm., Tada, Taiwan Chōrui Ippan, p. 73 ; *Accipiter sp.*, Tada, op. cit., p. 71, No. 122.

Specimens from :

Kiu Kong Chin Mt., March.

Taimari (Taitō Distr.), Aug. 24.

Subfamily **Aquilinæ**.

56. **Aquila heliaca** Savig.

Grant and La Touche, Ibis, 1907, p. 258.

Obtained in Apes' Hill (Hōzan Distr.)

57. **Spilornis cheela** (Lath.) **Ōkammuriwashii*.

Swinhoe, P. Z. S., 1871, p. 340 ; La Touch, Ibis, 1898, p. 372 ; Tada, Taiwan Chōrui Ippan, p. 72 ; Grant and La Touche, Ibis, 1907, p. 258. Obtained in Suisha (Nantō Distr.), Oct. 6.

58. **Spizaetus nipalensis** Hodgs. *Kumataka*.

Swinhoe, P. Z. S., 1871, p. 339; Grant and La Touche, Ibis, 1907, p. 258; *Spizaetus nipalensis*? La Touche, op. cit., 1895, p. 337.

Subfamily Buteoninæ.

59. **Buteo vulgaris** Leach. *Nosuri*.
Buteo asiaticus Swinhoe, P. Z. S., 1871, p. 339; Tada, Taiwan Chōrui Ippan, p. 72; *Buteo plumipes* (Hodgs.), Grant and La Touche, Ibis, 1907, p. 257.

60. **Butastur indicus** (Gmel.). *Sashiba*.
 Grant and La Touche, Ibis, 1907, p. 258; Tada, Taiwan Chōrui Ippan p. 72; *Poliornis polyogenys* (Temm. and Schl.), Swinhoe, P. Z. S., 1891, p. 340.

Obtained in Shisangan (Taihoku Distr.), Nov. 13.

61. **Milvus ater melanotis** Temm. and Schl. *Tobi*.
 Salvadori, Cat. B. Br. Mus., i, p. 324; La Touche, Ibis, 1895, p. 337; La Touche, op. cit., 1898, p. 373; Tada, Taiwan Chōrui Ippan, p. 70; Grant and La Touche, Ibis, 1907, p. 158; *Milvus govinda* Sykes, Swinhoe, P. Z. S., 1871, p. 341.

Specimens from:

Harōei (Taitō Distr.), Sept. 5.

Hasshiran (Taihoku Distr.), Sept. 2.

Shūshū (Tainan Distr.), Feb. 5, 8.

Hokuzan (North Hill) (Toroku Distr.).

Subfamily Falconinæ.

62. **Falco tinnunculus japonicus** Temm. and Schl. *Chōgenbō*.
Tinnunculus alaudarius var. *japonicus* Swinhoe, P. Z. S., 1871, p. 340; *Falco tinnunculus* L., La Touche, Ibis, 1895, p. 337; La Touche, op. cit., 1898, p. 372; Tada, Taiwan Chōrui Ippan, p. 71, *Cerchneis japonicus* (Temm. and Schl.), Grant and La Touche, Ibis, 1907, p. 258.

Specimens from:

Shūshū (Tainan Distr.), Feb. 12.

Taihoku (Taihoku Distr.), Jan. 12.

63. **Falco peregrinus** L. *Hayabusa*.

Swinhoe, P. Z. S., 1871, p. 340; La Touche, Ibis, 1898, p. 372;
Tada, Taiwan Chōrui Ippan, p. 71; Grant and La Touche, Ibis, 1907,
p. 258.

Specimens from :

Kannonzan, Tansui (Taihoku Distr.), March 1.

Saikichiyo (Pe Ting) (Pescadores IIs.), March.

Family PANDIONIDÆ.

64. **Pandion haliaetus** (L.). *Misago*.

Swinhoe, P. Z. S., 1871, p. 340; La Touche, Ibis, 1898, p. 372;
Tada, Taiwan Chōrui Ippan, p. 73; Grant and La Touche, Ibis, 1907,
p. 256.

Specimens from :

Suishako (Nantō Distr.), Dec. 8.

Kobi (Taihoku Distr.)

Order GALLIFORMES.

Suborder TURNICES.

Family TURNICIDÆ.

65. **Turnix taigoor** (Sykes). *Indomifu-uzura*.

La Touche, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373;
Grant, Cat. B. Br. Mus., XXII, p. 530; Tada, Taiwan Chōrui Ippan,
p. 96; Grant and La Touche, Ibis, 1907, pp. 274, 275; *Turnix rost-
rata* Swinhoe, Elwes, P. Z. S., 1873, p. 667.

Obtained in Kobi (Taihoku Distr.), Jan. 13.

66. **Turnix dussumieri** (Temm.). **Himemifu-uzura*.

Swinhoe, P. Z. S., 1871, p. 401; Grant, Cat. B. Br. Mus., XXII,

p. 540; Tada, Taiwan Chōrui Ippan, p. 95; Grant and La Touche, Ibis, 1907, p. 275.

Obtained in Shūshū (Nantō Distr.), Feb. 23.

Suborder GALLI.

Family PHASIANIDÆ.

Subfamily Phasianinæ.

67. **Arboricola crudigularis** (Swinh.). **Miyama-Tekkei*.

Grant, Cat. B. Br. Mus., XXII, p. 211; Grant and La Touche, Ibis, 1907, p. 275; *Orcoperdix crudigularis* Swinh., P. Z. S., 1871, p. 400; Tada, Taiwan Chōrui Ippan, p. 94.

Specimens from :

Hokuzankō, Horisha (Nantō Distr.), April 28; July 12.

Banshiro (Kagi Distr.), May 5.

Hō-wōzan (Toroku Distr.), Feb. and March.

Racu Racu Mts., Jan. and Feb.

68. **Coturnix coturnix** (L.). *Uzura*.

Grant and La Touche, Ibis, 1907, p. 276; *Coturnix communis* or *C. japonica*?, La Touche, Ibis, 1898, p. 373.

69. **Excalfactoria chinensis** (L.). **Hime-uzura*.

Swinhoe, P. Z. S., 1871, p. 400; La Touche, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373; Grant, Cat. B. Br. Mus., XXII, p. 250; Tada, Taiwan Chōrui Ippan, p. 95; Grant and La Touche, Ibis, 1907, p. 276.

Specimens from :

Taihoku (Taihoku Distr.), Aug. 9.

Kobi.

Bangkimsing.

70. **Bambusicola sonorivox** Gould. **Tekkei*.

Swinhoe, P. Z. S., 1871, p. 400; Elwes, op. cit., 1873, p. 667;

La Touche, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373; Grant, Cat. B. Br. Mus., XXII, p. 259; Tada, Taiwan Chōrui Ippan, p. 92; Grant and La Touche, Ibis, 1907, p. 276.

Specimens from:

Hokuzankō, Horisha (Nantō Distr.), April 26.

Banshiro (Kagi Distr.), April 5, 25.

Basshishō (Taitō Distr.), Oct. 22.

Shisangan (Taihoku Distr.), July 25.

Naihoshishō, April 20.

Hōwōzan (Toroku Distr.) March.

Nankō (South cape) (Kōshun Distr.).

Bangkimsing.

71. **Gennæus swinhoii** (Gould) **Sankei*.

Grant, Cat. B. Br. Mus., XXII, p. 309; Grant and La Touche, Ibis, 1907, p. 276; *Euplocamus swinhoii* Gould, Elwes, P. Z. S., 1873, p. 667; La Touch, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373; Tada, Taiwan Chōrui Ippan, p. 93.

Specimens from:

Hokuzankō, Horisha (Nantō Distr.), April 21.

Teraso, July 30.

Hōwōzan (Toroku Distr.), Feb. and March.

Racu Racu Mts., Feb.

Nankō (south cape) (Kōshun Distr.).

Bangkimsing.

72. **Phasianus formosanus** Elliot **Taiwan-kiji*.

Elliot, P. Z. S., 1870, p. 406; Swinhoe, op. cit., 1871, p. 398; La Touche, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373; Grant, Cat. B. Br. Mus., XXII, p. 333; Tada, Taiwan Chōrui Ippan, p. 91; Grant and La Touche, Ibis, 1907, p. 277; Grant, op. cit., 1908, p. 606.

Specimens from:

Hasshōkei (Kagi Distr.), April 3.

Basshishō (Taitō Distr.), Oct. 26.

Taihorin (Toroku Distr.), April 2.

Hokuzan (Toroku Distr.), April 28.

Nankō (Kōshun Distr.), Feb. 13.

Kobi.

Bangkimsing.

73. **Calophasis mikado** Grant. **Mikado-kiji*.

Grant, Bull. B. O. C., XVI, p. 122; Grant and La Touche, Ibis, 1907, p. 277; Grant, Ibis, 1908, pp. 606-608, Pl. XIII.

Specimens from :

Racu Racu Mts. Feb.

Arizan (Kagi Distr.) April.

Order GRUIFORMES.

Family RALLIDÆ.

74. **Hypotænidia striata** (L.).

Swinhoe, P. Z. S., 1871, p. 415; Tada, Taiwan Chōrui Ippan, p. 90; Sharpe, Cat. B. Br. Mus., XXIII, p. 33; Grant and La Touche, Ibis, 1907, p. 272.

75. **Rallina formosana** Seeb. **Taiwan-ōkuina*.

Seeböhm, Ibis, 1895, pp. 146, 211; Tada, Taiwan Chōrui Ippan, p. 89; Grant and La Touche, Ibis, 1907, p. 272.

76. **Porzana fusca** (L.). *Hikuina*.

Limnobænus fuscus (L.), Sharpe, Cat. B. Br. Mus., XXIII, p. 146; *Amaurornis fuscus* (L.), Grant and La Touche, Ibis, 1907, p. 272.

Obtained in Tainan (Tainan Distr.).

77. **Amaurornis phœnicura** (Forst.). **Shirohara-kuina*.

Tada, Taiwan Chōrui Ippan, p. 88; Sharpe, Cat. B. Br. Mus., XXIII, p. 156, Grant and La Touche, Ibis, 1907, p. 272.

Specimens from :

Sanshiten (Kagi Distr.), Oct. 4.

Kagi (Kagi Distr.), Aug. 4.

Basshishō (Taitō Distr.), Oct. 24.

Taihoku (Taihoku Distr.), July 29.

Suisha (Nantō Distr.), Dec. 8.

Naikoshō, Aug. 20.

78. **Gallicrex cinerea** (Gmel.) *Seikei*.

Tada, Taiwan Chōrui Ippan, p. 89; Grant and La Touche, Ibis, 1907, p. 273; *Gallicrex cristata* (Lath.), Swinhoe, P. Z. S., 1871, p. 414.

79. **Gallinula chloropus** (L.)... .. *Ban*.

Swinhoe, P. Z. S., 1871, p. 414; Tada, Taiwan Chōrui Ippan, p. 89; Sharpe, Cat. B. Br. Mus., XXIII, p. 169; Grant and La Touche, Ibis, 1907, p. 272.

Obtained in Suisha (Nantō Distr.), Dec. 8.

80. **Fulica atra** (L.)... .. *Ōban*.

Swinhoe, P. Z. S., 1871, p. 414; Tada, Taiwan Chōrui Ippan, p. 89; Grant and La Touche, Ibis, 1907, p. 273.

Order CHARADRIIFORMES.

Suborder LIMICOLÆ.

Family CHARADRIIDÆ.

Subfamily Charadriinæ.

81. **Streptilas interpres** (L.) *Kyōjō-shigi*.

Tada, Taiwan Chōrui Ippan, p. 83; *Arénaria interpres* (L.), Grant and La Touche, Ibis 1907, p. 264.

Specimens from :

Hakusatō (Pescadores IIs.), January.

Karenkō (Taitō Distr.), Sept. 24, Oct. 1.

82. **Squatarola helvetica** (L.)... .. *Daizen*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 182.

83. **Charadrius fulvus** Gmelin. *Munaguro*.

Swinhoe, P. Z. S., 1871, p. 403; Tada, Taiwan Chōrui Ippan, p. 83; *Charadrius dominicus* P. L. S. Müll., Swinhoe, P. Z. S., 1871, p. 403; La Touche, Ibis, 1895, pp. 326, 327; Grant and La Touche, op. cit., 1907, p. 265; Sharpe, Cat. B. Br. Mus., XXIV, p. 195.

Specimens from :

Hakusatō (Pescadores IIs.), April 21.

Tōkichi-sho (Pescadores IIs.), March.

Saikichi-sho (Pescadores IIs.), March.

Shūshūkai (Nantō Distr.), Feb. 1.

Tansui (Taihoku Distr.), Sept. 9.

Giiran (Giiran Distr.), Nov. 2.

Kiujō (Banshiryō Distr.), Jan. 15.

84. **Charadrius minor** Wolf & Meyer. *Ko chidori*.

Tada, Taiwan Chōrui Ippan, P. 85; *Ægialitis dubia* (Scop.), Grant and La Touche, Ibis, 1907, p. 265; *Ægialitis dubius* (Scop.), Swinhoe, P. Z. S., 1871, p. 404.

Specimens from :

Shūshūkai (Nantō Distr.), Jan. 16.

Hokushabi, Oct. 17.

85. **Charadrius mongolicus** Pallas. *Medai-chidori*.

Ochthodromus mongolus Pall., Tada, Taiwan Chōrui Ippan, p. 84; *Ægialitis mongolica* (Pall.), Grant and La Touche, Ibis, 1907, p. 265.

Specimens from :

Hakusato (Pescadores IIs.), January.

Hattakutō (Pescadores IIs.), March.

86. **Charadrius geoffroyi** Wagl. *Ōmedai-chidori*.

Tada, Taiwan Chōrui Ippan, p. 83; *Ægialitis geoffroyi* (Wagl.), Swinhoe, P. Z. S., 1871, p. 404; Grant and La Touche, Ibis, 1907, p. 265; *Ochthodromus geoffroyi* (Wagl.), Sharpe, Cat. B. Br. Mus., XXIV, p. 217.

Obtained in Tōkō (Akō Distr.), Oct. 15.

87. **Charadrius cantianus** Latham *Shiro-chidori*.

Tada, Taiwan Chōrui Ippan, p. 84; *Ægialites dealbatus* Swinhoe, Elliot, P.Z.S., 1870, p. 138; Swinhoe, P. Z. S., 1871, p. 404; *Ægialitis dealbata* Swinh., Sharpe, Cat. B. Br. Mus., XXIV, p. 282; Grant and La Touche, Ibis, 1907, p. 265.

Specimens from :

Hakusatō (Pescadores Is.), January.

Giiran (Giiran Distr.), Nov. 2.

Anpin (Tainan Distr.), Jan. 2.

Tōkō (Akō Distr.), Sept.

Taitokōshō, Sept. 27.

*88. **Lobivanellus cinereus** (Blyth). *Keri*.

Obtained in Tainan (Tainan Distr.), April.

89. **Vanellus vulgaris** Bechst. *Tageri*.

Vanellus cristatus Wolf & Meyer, Tada, Taiwan Chōrui Ippan, p. 85; *Vanellus venellus* (L.), Grant and La Touche, Ibis, 1907, p. 264.

90. **Hæmatopus osculans** Swinh. *Miyakodori*.

Swinhoe, P. Z. S., 1871, p. 405; Grant and La Touche, Ibis, 1907, p. 264.

Obtained in Apes' Hill Creek (Hōzan Distr.).

*91. **Himantopus himantopus** (L.). **Seitaka-shigi*.

Chikukō (Tainan Distr.), May.

92. **Recurvirostra avocetta** (L.). *Sorihashi-seitaka-shigi*.

Grant and La Touche, Ibis, 1907, p. 265.

Obtained in Apes' Hill Creek (Hōzan Distr.).

Subfamily **Tringinae**.

93. **Numenius arquatus** (L.). *Daishaku-shigi*.

Grant and La Touche, Ibis, 1907, p. 265; *Numenius arquatus* (L.), Sharpe, Cat. B. Br. Mus., XXIV, p. 341; *Numenius lineatus* Cuv., Swinhoe, P. Z. S., 1871, p. 410.

94. **Numenius variegatus** (Scop.). *Chūshaku-shigi*.
Ogawa, Dōbutsugakuzasshi, 1906, p. 131; Grant and La Touche, Ibis, 1907, p. 266; Sharpe, Cat. B. Br. Mus., XXIV, p. 361; *Numenius luzoniensis* (Gmel.), Swinhoe, P. Z. S., p. 871, p. 410; *Numenius pheopus variegatus* (Scop.), Tada, Taiwan Chōrui Ippan, p. 87.

Specimens from :

Tainan (Tainan Distr.), Oct. 30.

Tansui (Taihoku Distr.), May 5.

Menkatō (Crag) (Kiirun Distr.), Sept. 7.

95. **Numenius minutus** Gould. *Kōshaku shigi*.
Swinhoe, P. Z. S., 1871, p. 409; Grant and La Touche, Ibis, 1907, p. 266.

96. **Numenius cyanopus** Vieillot. *Hōroku-shigi*.
Grant and La Touche, Ibis, 1907, p. 266; *Numenius tahitiensis*, Swinhoe, P. Z. S., 1871, p. 410.

Obtained in Tansui (Taihoku Distr.), May 5.

97. **Limosa rufa uropygialis** (Gould). *Ōsorihashi-shigi*.
Limosa uropygialis Gould, Swinhoe, P. Z. S., 1871, p. 406; Tada, Taiwan Chōrui Ippan, p. 86; *Limosa novæ zealandiæ* Gray, Grant and La Touche, Ibis, 1907, p. 266.

98. **Totanus terekus** (Lath.) *Sorihashi-shigi*.
Terekia cinerea (Güld.), Grant and La Touche, Ibis, 1907, p. 267.

Specimens from :

Tansui (Taihoku Distr.), May 5.

Tainan (Tainan Distr.).

99. **Totanus incanus brevipes** (Vieillot). *Meriken-kiashi-shigi*.
Totanus incanus (Gmel.), Swinhoe, P. Z. S., 1871, p. 406; *Totanus brevipes* Vieill., Grant and La Touche, Ibis, 1907, p. 267; Sharpe, Cat. B. Br. Mus., XXIV, p. 449; *Heteractitis brevipes* (Vieill.), Tada, Taiwan Chōrui Ippan, p. 84.

Obtained in Karenkō (Taitō Distr.), Sept. 23.

100. **Totanus glareola** (Gmel.) *Takabu-shigi*.

Grant and La Touche, *Ibis*, 1907, p. 267.

101. **Totanus hypoleucus** (L.) *Iso-shigi*.

Tada, Taiwan Chōrui Ippan, p. 83 ; *Tringoides hypoleucus* (L.),

Grant and La Touche, *Ibis*, 1907, p. 267 ; Sharpe, Cat. B. Br. Mus., XXIV, p. 456.

Specimens from :

Hasshiran (Taihoku Distr.), Aug. 30.

Tansui (Taihoku Distr.), Sept. 9.

Manka (Taihoku Distr.), April 18.

Shisangan (Taihoku Distr.), Aug. 29.

Tairinsankō (Taihoku Distr.), Aug. 24.

Hasshōkei (Kagi Distr.), Oct. 19.

Sanshiten (Kagi Distr.), Nov. 24.

Hokushabi, Oct. 16.

102. **Totanus ochropus** (L.) *Kusa-shigi*.

Swinhoe, P. Z. S., 1871, p. 406 ; Grant and La Touche, *Ibis*, 1907, p. 267 ; *Helodromus ochropus* (L.), Sharpe, Cat. B. Br. Mus., XXIV, p. 437 ; *Tringa ochropus* L., Tada, Taiwan Chōrui Ippan, p. 85.

Specimens from :

Shūshūkai (Nantō Distr.), Feb. 14.

Gyochi, Horisha (Nantō Distr.), Dec. 5.

103. **Totanus stagnatilis** Bechst. *Ko-aoashi-shigi*.

Swinhoe, P. Z. S., 1871, p. 405 ; Sharpe, Cat. B. Br. Mus., XXIV, p. 422 ; Tada, Taiwan Chōrui Ippan, p. 85 ; Grant and La Touche, *Ibis*, 1907, p. 266.

Obtained in Tainan (Tainan Distr.), Aug. 30.

104. **Totanus glottis** (L.) *Aoashi-shigi*.

Glottis nebularis (Gunner), Sharpe, Cat. B. Br. Mus., XXIV, p. 481 ; Grant and La Touche, *Ibis*, 1907, p. 267.

Obtained in Tainan (Tainan Distr.), January.

105. **Totanus calidris** (L.) *Akaashi-shigi*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 414; Grant and La Touche, Ibis, 1907, p. 266.

106. **Phalaropus hyperboreus** (L.)... .. *Akaeri-hircashi-shigi*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 698; Grant and La Touche, Ibis, 1907, p. 269.

107. **Limicola sibirica** Dresser... .. *Kiriai*.

Tringa platyrhyncha Temm., Swinhoe, P. Z. S., 1871, p. 408; Tada, Taiwan Chōrui Ippan, p. 86; *Limicola platyrhyncha* (Temm.), Grant and La Touche, Ibis, 1907, p. 268.

108. **Tringa ruficollis** Pallas. *Tōnen*.

Grant and La Touche, Ibis, 1907, p. 268; *Limonites ruficollis* (Pall.), Sharpe, Cat. B. Br. Mus., XXIV, p. 545; *Tringa minuta* Leisl., Tada, Taiwan Chōrui Ippan, p. 85.

Specimens from :

Hakusatō (Pescadores IIs.), January.

Hattakutō (Pescadores IIs.), March.

Anpin (Tainan Distr.), Jan. 12.

109. **Tringa acuminata** (Horsf.) *Uzura-shigi*.

Grant and La Touche, Ibis, 1907, p. 268; *Heteropygia acuminata* (Horsf.), Sharpe, Cat. B. Br. Mus., XXIV, p. 566.

110. **Tringa alpina pacifica** (Coues) *Hama-shigi*.

Tada, Taiwan Chōrui Ippan, p. 87; *Tringa alpina* (L.), Tada, op. cit., p. 84; *Pelidna americana* (Cassin.), Sharpe, Cat. B. Br. Mus., XXIV, pp. 608, 769; *Tringa americana* Cassin., Grant and La Touche, Ibis, 1907, p. 268.

Obtained in Hakusatō (Pescadores IIs.), January.

111. **Tringa arenaria** L... .. *Miyubi-shigi*.

Calidris arenaria (L.), Grant and La Touche, Ibis, 1907, p. 267.

112. **Tringa temmincki** Leisl. **Ojiro-tōnen*.

Grant and La Touche, Ibis, 1907, p. 268.

Obtained in Anpin (Tainan Distr.), Dec. 1.

113. **Tringa subarquata** (Güld.) *Saruhamas-shigi*.

Swinhoe, P. Z. S., 1871, p. 409; Tada, Taiwan Chōrui Ippan p. 87.

Subfamily Scolopacinae.

114. **Rostratula capensis** (L.) *Tama-shigi*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 633; Grant and La Touche, Ibis, 1907, p. 269, *Rhynchæa bengalensis* (L.), Swinhoe, P. Z. S., 1871, p. 408; *Rhynchæa capensis* (L.), Tada, Taiwan Chōrui Ippan p. 86.

Specimens from :

Taikokan (Taihoku Distr.), Jan. 29.

Taihoku (Taihoku Distr.), Jan. and Feb.

115. **Gallinago cælestris** (Frenzel). *Ta-shigi*.

Gallinago gallinago (L.), Sharpe, Cat. B. Br. Mus., XXIV, p. 633; Tada, Taiwan Chōrui Ippan, p. 86; Grant and La Touche, Ibis, 1907, p. 269; *Gallinago scolopacina* Bp., Swinhoe, P. Z. S., 1871, p. 407.

116. **Gallinago megala** Swinhoe *Chū-shigi*.

Swinhoe, P. Z. S., 1871, p. 407; Sharpe, Cat. B. Br. Mus., XXIV, p. 624; Tada, Taiwan Chōrui Ippan, p. 86; Grant and La Touche, Ibis, 1907, p. 268.

117. **Gallinago gallinula** (L.). *Ko-shigi*.

Tada, Taiwan Chōrui Ippan, p. 86; Grant and La Touche, Ibis, 1907, p. 269; *Limnocryptes gallinula* (L.), Swinhoe, P. Z. S., 1871, p. 407; Sharpe, Cat. B. Br. Mus., XXIV, p. 665.

118. **Gallinago stenura** (Kuhl.). *Hario-shigi*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 619; Grant and La Touche, Ibis, 1907, p. 268; *Gallinago horsfieldi* (Gray), Swinhoe, P. Z. S., 1871, p. 401.

Specimens from :

Gyochi, Horisha (Nantō Distr.), Dec. 14.

Karenkō (Taitō Distr.), Feb. 17, 18.

Naiho (Kagi Distr.), Jan. 6.

Baishikō (Kagi Distr.), Dec. 31.

119. **Scolopax rusticola** (L.) *Yama-shigi*.

Sharpe, Cat. B. Br. Mus., XXIV, p. 671; Grant and La Touche, Ibis, 1907, p. 269.

Family GLAREOLIDÆ.

120. **Glareola orientalis** Leach. **Tsubame-chidori*.

Swinhoe, P. Z. S., 1871, p. 403; Sharpe, Cat. B. Br. Mus., XXIV, p. 58; Tada, Taiwan Chōrui Ippan, p. 87; Grant and La Touche, Ibis, 1907, p. 264.

Specimens from :

Karenkō (Taitō Distr.), Sept. 25.

Tainan (Tainan Distr.), July 6.

Pescadores Is.

Family PARRIDÆ.

121. **Hydrophasianus chirurgus** (Scop.) **Renkaku*.

Swinhoe, P. Z. S., 1871, p. 414; La Touche, Ibis, 1895, p. 327; Grant and La Touche, Ibis 1907, p. 264; Hydrophasis chirurgus Scop., Sharp, Cat. B. Br. Mus., XXIV, p. 69.

Specimens from :

Tainan (Tainan Distr.), July 6.

Takō (Hōzan Distr.).

Suborder LARI.

Family LARIDÆ.

Subfamily Larinæ.

122. **Larus ridibundus** (L.) *Yuri-kamome*.

Grant and La Touche, *Ibis*, 1907, p. 271.

Obtained in Tōkō (Akō Distr.), Mar. 20.

123. **Larus saundersi** Swinh. *Zuguro-kamome*.

Saunders, Cat. B. Br. Mus., XXV, p. 183 ; Grant and La Touche, *Ibis*, 1907, p. 271 ; *Chroicocephalus saundersi*, Swinhoe, P. Z. S., 1871, p. 273.

124. **Larus canus** (L.). *Kamome*.

Saunders, Cat. B. Br. Mus., XXV, p. 277 ; Grant and La Touche, *Ibis*, 1907, p. 270.

125. **Larus crassirostris** Vieill. *Umineko*.

Saunders, Cat. B. Br. Mus., XXV, p. 227 ; Grant and La Touche, *Ibis*, 1907, p. 270.

126. **Larus vegæ** (Palmén). *Seguro-kamome*.

Tada, Taiwan Chōrui Ippan, p. 81.

Specimens from :

Pescadores IIs., Feb.

Wanbaisho (Pescadores IIs.), Jan.

Subfamily Sterninae.

127. **Sterna sinensis** (Gmel.). *Ko-ajisashi*.

Saunders, Cat. B. Br. Mus., XXV, p. 113 ; Grant and La Touche, *Ibis*, 1907, p. 270 ; *Sterna minuta* L., Swinhoe, P. Z. S., 1871, p. 422.

Specimens from :

Harōyēi (Taitō Distr.), Sept. 5.

Hassiran (Taihoku Distr.), Aug. 30.

128. **Sterna stolidus** (L.). *Kuro-ajisashi*.

Tada, Taiwan Chōrui Ippan, p. 82 ; Ogawa, Dōbutsugaku-zasshi, 1906, p. 127 ; *Anous stolidus* (L.), Swinhoe, P. Z. S., 1871, p. 422 ; Saunders, Cat. B. Br. Mus., XXV, p. 136 ; Grant and La Touche, *Ibis*, 1907, p. 270.

Specimens from :

Agincourt (Kiirun Distr.).

Menkatō (Crag) (Kiirun Distr.), June 17.

129. **Sterna anæstheta** Scop. *Manijiro-ajisashi.*

Tada, Taiwan Chōrui Ippan, p. 82; Ogawa, Dōbutsugaku-zasshi, 1906, p. 129; Grant and La Touche, Ibis, 1907, p. 270; *Haliplana anæstheta* Scop., Swinhoe, P. Z. S., 1871, p. 422.

Specimens from :

Menkatō (Crag) (Kiirun Distr.), July 1, June 19.

Pescadores IIs.

*130. **Sterna fuliginosa** Gmel. *Seguro-ajisashi.*

Specimens from :

Tainan (Tainan Distr.), April.

Menkatō (Crag) (Kiirun Distr.), May 31.

Agincourt (Kiirun Distr.), Jan.

131. **Sterna bergii** Licht. *Ō-ajisashi.*

Tada, Taiwan Chōrui Ippan, p. 81; Grant and La Touche, Ibis 1907, p. 270; *Sterna bergii subsp.?*, Ogawa, Dōbutsugaku-zasshi, 1906, p. 125; *Thalasseus pellicanoides* (King), Swinhoe, P. Z. S., 1871, p. 422.

Specimens from :

Karenkō (Taitō Distr.), Sept. 28.

Agincourt.

Menkatō (Crag) (Kiirun Distr.), Aug. 4.

132. **Hydrochelidon hybrida** (Pall.) **Kurohara-ajisashi.*

Swinhoe, P. Z. S., 1871, p. 421; Saunders, Cat. B. Br. Mus., XXV, p. 10; Tada, Taiwan Chōrui Ippan, p. 82; Grant and La Touche, Ibis, 1907, p. 269.

133. **Hydroprogne caspia** (Pall.) **Oni-ajisashi.*

Grant and La Touche, Ibis, 1907, p. 270.

Obtained in Pescadores IIs., May 15.

Suborder COLUMBÆ.

Family COLUMBIDÆ.

Subfamily Peristerinæ.

134. **Turtur orientalis** (Lath.). *Kiji-bato*.
 Salvadori, Cat. B. Br. Mus., XXI, p. 403; Tada, Taiwan Chōrui
 Ippan, p. 65; Grant and La Touche, Ibis, 1907, p. 274; *Turtur rupi-*
cola, La Touche, op. cit., 1895, pp. 312, 314 and 338.

Specimens from :

- Harōyei (Taitō Distr.), Sept. 2, 3.
 Banshiro (Kagi Distr.), Aug. 29.
 Suwō (Giiran Distr.), Nov.
 Kōdenshō (Kagi Distr.), March 7.
 Hōwōzan (Toroku Distr.), March.

135. **Turtur humilis** (Temm.). *Beni-bato*.
 Swinhoe, P. Z. S., 1871, p. 397; Salvadori, Cat. B. Br. Mus.,
 XXI, p. 434; Tada, Taiwan Chōrui Ippan, p. 63; Grant and La
 Touche, Ibis, 1907, p. 273.

Specimens from :

- Manka (Taihoku Distr.), April 29.
 Hasshiran (Taihoku Distr.), Sept. 1.
 Taimari (Taitō Distr.), Sept. 1.
 Shūshūgai (Nantō Distr.), Jan. 16, 21, Feb. 13.
 Kōdenshō (Kagi Distr.), Mar. 28.
 Sanshiten (Kagi Distr.), Sept. 1.
 Banshiro (Kagi Distr.), April 19.
 Suiginreki, Sept. 17.
 Wankyō, Oct. 14.
 Taiyo (Junk) (Pescadores IIs.), April.

136. **Turtur chinensis** (Scop.). **Kanoko-bato*.

Swinhoe, P. Z. S., 1871, p. 397; La Touche, Ibis, 1895, p. 338; La Touche, op. cit., 1898, p. 373; Salvadori, Cat. B. Br. Mus., XXI, p. 439; Tada, Taiwan Chōrui Ippan, p. 64; Grant and La Touche, Ibis, 1907, p. 274; Grant, Ibis, 1908, p. 606.

Specimens from :

Manka (Taihoku Distr.), Feb.

Hasshiran (Taihoku Distr.), Sept. 14.

Harōyei (Taitō Distr.), Sept. 2.

Shūshū (Nantō Distr.), Jan. 21, Feb. 4.

Rantaisan (Nantō Distr.), March 14.

Ratō (Giiran Distr.), Nov. 16.

Sanshiten (Kagi Distr.), Sept. 4.

Banshiro (Ensui Distr.), April 25.

Hokushabi, Oct. 17.

Wankyō, Oct. 14.

137 **Chalcophaps indica** (L.)... ..*Kin-bato*.

La Touche, Ibis, 1895, pp. 328, 329, 337; Tada, Taiwan Chōrui Ippan, p. 65; Salvadori, Cat. B. Br. Mus., XXI, p. 514; Grant and La Touche, Ibis, 1907, p. 274; *Chalcophaps formosana* Swinhoe, P. Z. S., 1871, p. 397; Elwes, P. Z. S., 1873, p. 667.

Specimens from :

Taimari (Taitō Distr.), Aug. 24, 25.

Anpin (Tainan Distr.).

Nankō (Kōshun Distr.).

Subfamily Columbinae.

138. **Columba pulchricollis** Hodg... **Taiwan-juzukake-bato*.

Salvadori, Cat. B. Br. Mus., XXI, p. 305; Grant and La Touche, Ibis, 1907, p. 274.

Specimens from :

Shūshūzan (Nantō Distr.).

Tappansha, Jan. 8, 13.

Racu Racu Mts. Jan.

?139. ***Columba intermedia** Stickl. *Kawara-bato*.

A specimen from :

River Tansui (Taihoku Distr.), Sept. 9.

140. ***Macropygia phæa** McGregor. **Onaga-bato*.

A specimen from :

Kōtōsho (Botel Tabago), Dec. 20.

Subfamily **Treroninae**.

141. **Sphenocercus sororius** Swinh. **Taiwan-awo-bato*.

Swinhoe, P. Z. S., 1871, p. 396 ; Elwes, op. cit., 1873 ; Salvadori, Cat. B. Br. Mus., XXI, p. 13 ; Tada, Taiwan Chōrui Ippan, p. 67 ; Grant and La Touche, Ibis, 1907, p. 273 ; Grant, op. cit., 1908, p. 606.

Specimens from :

Shūshū (Nantō Distr.), Mar. 10.

Rantaisan (Nantō Distr.), Jan. Feb.

Hōwōzan (Toroku Distr.), March.

Banshiro (Kagi Distr.), May 2.

Shamikisha, April 1.

142. **Sphenocercus formosæ** (Swinh.)
**Taiwan-zuaka-awo-bato*.

Salvadori, Cat. B. Br. Mus., XXI, p. 13 ; Tada, Taiwan Chōrui Ippan, p. 67 ; McGregor, Hand l. B. Phil. I, p. 9 ; Grant and La Touche, Ibis, 1907, p. 273 ; *Treron formosæ* Swinhoe, P. Z. S., 1871, p. 396 ; Elwes, op. cit., 1873, p. 669.

Specimens from :

Basshishō (Taitō Distr.), Oct. 23.

Kōtōshō (Botel Tabago), May.

Order CUCULIFORMES.

Suborder CUCULI.

Family CUCULIDÆ.

Subfamily Cuculinæ.

143. **Cuculus canolus** (L.). *Kakkō*.

Tada, Taiwan Chōrui Ippan, p. 58.

144. **Cuculus poliocephalus** Lath. *Hototogisu*.

Swinhoe, P. Z. S., p. 395; Grant and La Touche, Ibis, 1907, p.

196; Tada, Taiwan Chōrui Ippan, p. 58.

Obtained in Tansui (Taihoku Distr.).

145. **Cuculus saturatus** Hodgs. *Tsutsudori*.

Grant and La Touche, Ibis, 1907, p. 196; *Cuculus intermedius*

La Touche, Ibis, 1898, p. 370; Shelley, Cat. B. Br. Mus., XIX, p.

252; Tada, Taiwan Chōrui Ippan, p. 58.

Specimens from :

Tansui (Taihoku Distr.), April 6.

Shisangan (Taihoku Distr.), Sept. 4.

Taimari (Taitō Distr.), Aug. 16.

Harōei (Taitō Distr.), Sept. 4.

Banshirō (Ensui Distr.), April 29.

Chūho (Banshoryō Distr.), Aug. 10.

146. **Centrops javanicus** Dumont. **Banken*.

Shelley, Cat. B. Br. Mus., XIX, p. 354; Grant and La Touche,

Ibis, 1907, p. 196; Grant, op. cit., 1908, p. 905; *Centrops bengalensis*

(Gmel.), Swinhoe, P. Z. S., 1871, p. 393; La Touche, Ibis, 1895; p.

336; La Touche; op. cit., 1898, p. 371; Shelley, Cat. B. Br. Mus.,

XIX, p. 352; Taiwan Chōrui Ippan, p. 58.

Specimens from :

Taihoku (Taihoku Distr.), July 29.

Shisangan (Taihoku Distr.), Nov. 15

Manka (Taihoku Distr.).

Taiharō (Taitō Distr.), Oct. 16.

Taimari (Taitō Distr.), Aug. 28.

Basshishō (Taitō Distr.), Oct. 22.

Arisan (Taitō Distr.), April 4.

Rōnō (Banshoryō Distr.), July 20.

Banshiro (Kagi Distr.), Aug. 26, 28.

Teraso (Kōshun Distr.), July 29.

Rantaisan (Nantō Distr.).

Order CORACIIFORMES.

Suborder CORACIÆ.

Family ALCEDINIDÆ.

Subfamily Halcyoninæ.

147. **Halcyon coromanda** (Lath.). *Miyama-shōbin*.

Tada, Taiwan Chōrui Ippan, p. 61 ; *Halcyon coromandus* (Lath.), Sharpe, Cat. B. Br. Mus., XVII, p. 217 ; Grant and La Touche, Ibis, 1907, p. 197.

Obtained in Horisha (Nantō Distr.), May 5, 10.

Subfamily Alcedininæ.

148. **Alcedo bengalensis** Gmel. *Kawasemi*.

La Touche, Ibis, 1895, p. 336 ; La Touche, Ibis, 1898, p. 370 ; *Alcedo ispida* L., Sharpe, Cat. B. Br. Mus., XVII, p. 141, Grant and La Touche, Ibis, 1907, p. 197 ; Grant, op. cit., 1908, p. 685 ; *Alcedo ispida bengalensis* (Gmel.), Tada, Taiwan Chōrui Ippan, p. 61.

Specimens from :

Rantaisan (Nantō Distr.), March 19.

Rinkiho (Lim-ki-po), March.

Suborder STRIGES.

Family STRIGIDÆ.

Subfamily Striginæ.

149. **Strix candida** Tickell. **Taiwan-fukurō*.
 Swinhoe, P. Z. S., 1871, p. 344; Sharpe, Cat. B. Br. Mus., ii, p.
 308; Tada, Taiwan Chōrui Ippan, p. 69; Grant and La Touche, Ibis,
 1908, p. 254.

Obtained in Horisha (Nantō Distr.), Oct.

Subfamily Buboninæ.

150. **Syrnium nivicola** Hodgs.
 Grant, Ibis, 1908, p. 605.
 Obtained in Rantaisan (Nantō Distr.), March 9.
151. **Syrnium indranee** (Sykes).
 Grant and La Touche, Ibis, 1907, p. 255; *Bulaca newalensis*
 (Hodgs.), Swinhoe, P. Z. S., p. 344; La Touche, Ibis, 1898, p. 372;
 Sharpe, Cat. B. Br. Mus., ii, p. 281; Tada, Taiwan Chōrui Ippan, p. 69.
152. **Glaucidium pardalotum** (Swinh.).
 Sharpe, Cat. B. Br. Mus., ii, p. 214; Grant and La Touche, Ibis,
 1907, p. 255.
 Obtained in Hōwōzan (Toroku Distr.), Feb. & March.
153. **Ninox japonica** Temm. & Schl. *Awobazuku*.
 Swinhoe, P. Z. S., 1871, p. 343; Grant and La Touche, Ibis,
 1907, p. 255; *Ninox scutulata* (Raffles), Tada, Taiwan Chōrui Ippan,
 p. 68.
 Obtained Inzan (Giiran Distr.), Nov. 2.
154. **Scops hambroeki** (Swinh.). **Taiwan-konohazuku*.
 Sharpe, Cat. B. Br. Mus., ii, p. 64; Seebohm, Ibis, 1895, p. 213;
 La Touche, op. cit., p. 325, 336; Grant and La Touche, op. cit., 1907,
 p. 254; *Lempijius hambroeki* Swinhoe, P. Z. S., 1871, p. 344;

Ephialtes hambroeki Swinh., An. & Mag. N. H., 1870, p. 153; Elwes, P. Z. S., 1873, p. 667.

Specimens from :

Racu Racu Mts., January.

Hōwōzan (Nantō Distr.), March.

Tansui (Taihoku Distr.).

155. **Scops elegans** (Cassin). *Riukiu-konohazuku*.

Sharpe, Cat. B. Br. Mus., ii, p. 87; Tada, Taiwan Chōrui Ippan, p. 69; *Lempijijs glabripes* Swinhoe, P. Z. S., 1871, p. 343; *Scops glabripes* (Swinh.), La Touche, Ibis, 1898, p. 372; Grant and La Touche, op. cit., 1907, p. 255; Grant, op. cit., 1908, p. 605.

Specimens from :

Shisangan (Taihoku Distr.), Sept. 19.

Tansui (Taihoku Distr.), Mar. 7.

Kagi (Kagi Distr.), April 7.

Sanshiten (Kagi Distr.), June 21.

Arisan (Kagi Distr.), April.

156. **Scops japonicus** Temm. & Schl. *Konohazuku*.

La Touche, Ibis, 1898, p. 371; *Scops stictonota* Sharpe, Hand L. B., i. p. 285; Grant and La Touche, Ibis, 1907, p. 255; *Scops pennatus* La Touche, op. cit., 1895, p. 337.

Specimens from :

Kobi, Nov. 1 and Feb. 19.

Takao.

Suborder CAPRIMULGI.

Family CAPRIMULGIDÆ.

Subfamily Caprimulginae.

157. **Caprimulgus monticola** Frankl. * *Taiwan-kasuidori*.

Hartert, Cat. B. Br. Mus., XVI, p. 547; Grant and La Touche, Ibis, 1907, p. 197; *Caprimulgus stictomus* Swinhoe, P. Z. S., 1871,

p. 345; Elwes, op. cit., 1873, p. 667; La Touche, Ibis, 1878, p. 370; Tada, Taiwan Chōrui Ippan, p. 62.

Obtained in Kobi.

Suborder CYPSELI.

Family CYPSELIDÆ

Subfamily Chæturinæ.

*158. **Chætura nudipes** Hodgs. . . . **Kurobitac-hariotsubame*.

Subfamily Cypselinæ.

159. **Cypselus pacificus** (Lath.). *Amatsubame*.
Swinhoe, P. Z. S., 1871, p. 345; Tada, Taiwan Chōrui Ippan, p. 62; Grant and La Touche, Ibis, 1907, p. 197; *Micropus pacificus* Hartert, Cat. B. Br. Mus, XVI, p. 448.

160. **Cypselus subfurcatus** Blyth. **Hime-amatsubame*.
Swinhoe, P. Z. S., 1871, p. 345; La Touche, Ibis, 1895, p. 336; La Touche, op. cit., 1898, p. 370; Tada, Taiwan Chōrui Ippan, p. 62; Grant and La Touche, Ibis, 1907, p. 197.

Specimens from :

Kobi, May 27.

Apes Hill, Takaw, Nov.

Tansui (Tansui Distr.), May 27.

Family CAPITONIDÆ.

161. **Cyanops nuchalis** (Gould). **Goshikidori*.
La Touche, Ibis, 1895, pp. 321, 324, 336; Tada, Taiwan Chōrui Ippan, p. 57; Grant and La Touche, Ibis, 1907, p. 195; Grant, op. cit., 1908, p. 605.

Specimens from :

Rantaisan (Nantō Distr.).

- Horisha (Nantō Distr.), Sept. 2.
 Taimari (Taitō Distr.), Aug. 26.
 Taiharō (Taitō Distr.), Oct. 13.
 Arizan (Kagi Distr.), April 4.
 Hōwōzan (Toroku Distr.), Feb. & Mar.
 Niitakayama (Mt. Morrison), Jan.
 Racu Racu Mts., Jan.
 Teraso (Kōshun Distr.), July 29.

Family **PICIDÆ**.

162. **Iyngipicus kalensis** (Swinh.) **Taiwan-kogera*.
 Swinhoe, P. Z. S., 1871, p. 392; Hargitt, Cat. B. Br. Mus.,
 XVIII, p. 315; Grant and La Touche, Ibis, 1907, p. 195, *Iyngipicus*
scintilliceps Swinhoe, La Touche, Ibis, 1895, p. 336.

Specimens from :

- Taiharō (Taitō Distr.), Oct. 13.
 Sanshiten (Kagi Distr.), Sept. 4.
 Horisha (Nantō Distr.), Oct. 7.
 Banshiro (Kagi Distr.), April 23 and Aug. 31.
 Hōwōzan (Toroku Distr.), Feb.
 Niitakayama (Mt. Morrison), January.

163. **Iyngipicus wattersi** Salv. & Gigl.
 Hargitt, Cat. B. Br. Mus., XVIII, p. 317; Grant and La Touche,
 Ibis, 1907, p. 195.

164. **Gecinus tancolo** Gould. **Taiwan-yamagera*.
 Swinhoe, P. Z. S., 1871, p. 392; Tada, Taiwan Chōrui Ippan, p.
 56; Grant and La Touche, Ibis, 1907, p. 144; *Gecinus guerini* Har-
 gitt, Cat. B. Br. Mus., XVIII, p. 55 (Part.).

Obtained in Tansui (Tausui Distr.).

165. **Dendrocopus insularis** (Gould) **Taiwan-ōakagera*.
 Hargitt, Cat. B. Br. Mus., XVIII, p. 272; Grant and La Touche,
 Ibis, 1907, p. 194; Grant, op. cit., 1908, p. 605; *Picus insularis*

Gould, Swinhoe, P. Z. S., 1871, p. 392; Elwes, op. cit., 1873, p. 667;
Tada, Taiwan Chōrui Ippan, p. 55.

Specimens from :

Rantaisan (Nantō Distr.), Mar. 8, May 21.

Hōwōzan (Toroku Distr.), March.

Arizan (Kagi Distr.), April 17.

Tappansha, Feb. 18.

Order PASSERIFORMES.

Group PASSERES ANISOMYODÆ.

Division CLAMATORES.

Family PITTIDÆ.

166. **Pitta nympha** Temm. & Schl. *Yairochō*.

La Touche, Ibis, 1895, p. 213; Scater, Cat. B. Br. Mus., XIV,
p. 425; Tada, Taiwan Chōrui Ippan, p. 34; Grant and La Touche,
Ibis, 1907, p. 194; *Pitta oreas* Swinh., P. Z. S., 1871, p. 375; Elwes,
op. cit., 1873, p. 667.

Specimens from :

Tapanii (Tainan Distr.), July 26, juv.

Horisha (Nantō Distr.), May 4, 6, 7, 9, 10

Group PASSERES DIACROMYODÆ.

Division OSCINES.

Family ALAUDIDÆ.

167. **Alauda sala** Swinh. **Taiwan-hibari*.

Elliot, P. Z. S., 1870, p. 354; La Touche, Ibis, 1898, p. 368;
Grant and La Touche, Ibis, 1907, p. 165; *Alauda gulgula sala*

Swinh., Hartert, Vogel Palæark. Fauna, p. 250; *Alauda wattersi* Swinh., P. Z. S., 1871, p. 389; La Touche, Ibis, 1895, pp. 318, 327, 335; Grant and La Touche, op. cit., 1907, p. 165.

Specimens from :

Sanshiten (Kagi Distr.), Sept. 17.

Pescadores Ils.

168. ***Alauda œlivox*** Swinh.

Hartert, Vogel Palæark. Fauna, p. 249.

Family MOTACILLIDÆ.

Subfamily Motacillinæ.

169. ***Motacilla taivana*** Swinh. *Tsumenaga-sekirci*.

Sharpe, Cat. B. Br. Mus., X, p. 514; La Touche, Ibis, 1895, p. 332; La Touche, op. cit., 1898, p. 364; Tada, Taiwan Chōrui Ippan, pp. 43, 44, 45; Grant and La Touche, Ibis, 1907, p. 166; Grant, op. cit., 1908, p. 602; *Budytes taiwanus* Swinh., Elliot, P. Z. S., 1870, p. 346; Swinhoe, P. Z. S., 1871, p. 364.

Specimens from :

Sanshiten (Kagi Distr.), Oct. 8.

Rantaisan (Nantō Distr.), Mar. 16, 18.

Horisha (Nantō Distr.), Oct. 16.

Harōei (Taitō Distr.), Sept. 6.

Basshishō (Taitō Distr.), Oct. 22, 23.

Kobi, May 28.

170. ***Motacilla melanope*** (Pall.)... .. *Ki-sekirci*.

La Touche, Ibis, 1895, p. 364; Tada, Taiwan Chōrui Ippan, p. 43; Grant and La Touche, Ibis, 1907, p. 106; *Calobates melanope* Swinh., P. Z. S., 1871, p. 364; La Touche, Ibis, 1895, p. 332.

Specimens from :

Kōdenshō (Kagi Distr.), Mar. 18.

Taimari (Taitō Distr.), Aug. 25.

Shisangan (Taihoku Distr.), Sept. 3.

Tōkichisho (Pescadores IIs.), March.

Taisho (Pescadores IIs.), April.

171. **Motacilla leucopsis** Gould. *Hōjiro-sekirei*.

La Touche, Ibis, 1895, p. 332; La Touche, op. cit., 1898, p. 364; Tada, Taiwan Chōrui Ippan, p. 42, 43; Oates, Faun. Brit. India, Birds, ii, p. 288; Grant and La Touche, Ibis, 1907, p. 164; Grant, op. cit., 1908, p. 602.

Specimens from:

Taisho (Pescadores IIs.), March.

Shisangan (Taihoku Distr.), Sept. 3.

Taimari (Taitō Distr.), Aug. 25.

Hashshōkei (Kagi Distr.), Oct. 18.

Rantaisan (Nantō Distr.), Mar. 18.

Kobi, April 27.

Racu Racu Mts., Feb.

172. **Motacilla ocularis** Swinh. **Taiwan-hakusekirei*.

Swinhoe, P. Z. S., 1871, p. 364; La Touche, Ibis, 1898, p. 364; Tada, Taiwan Chōrui Ippan, p. 45; Grant and La Touche, Ibis, 1907, p. 166; Grant, op. cit., 1908, p. 364.

Obtained in Rantaisan (Nantō Distr.), Mar. 18.

173. **Motacilla lugens** Pall. *Haku-sekirei*.

Grant and La Touche, Ibis, 1907, p. 166; *Motacilla lugens?*, La Touche, op. cit., 1895, p. 332.

Obtained in Taisho (Pescadores IIs.), April.

Subfamily Anthinae.

174. **Anthus maculatus** Hodgs. *Binsui*.

La Touche, Ibis, 1898, p. 364; Tada, Taiwan Chōrui Ippan, p. 46, 47; Grant and La Touche, Ibis, 1907, p. 166; Grant, op. cit., 1908, p. 602.

Specimens from:

Kōdenshō (Kagi Distr.), Mar. 7.

Gyochi, Horisha (Nantō Distr.), Dec. 14.

Rantaisan (Nantō Distr.), Mar. 18.

Hōwōzan (Toroku Distr.), March.

Taisho (Pescadores Ils.), March.

Tappansha, Dec. 22.

175. **Anthus cervinus** (Pall.)... .. *Muneaka-tahibari*.

La Touche, Ibis, 1895, p. 333 ; La Touche, op. cit., 1898, p. 364 ;

Tada, Taiwan Chōrui Ippan, p. 47 ; Grant and La Touche, 1907, p. 167.

Obtained in Gyochi, Horisha, (Nantō Distr.), Dec. 16.

177. **Anthus richardi** Vieill.

La Touche, Ibis, 1895, p. 333 ; La Touche, op. cit., 1898, p. 365 ;

Tada, Taiwan Chōrui Ippan, pp. 47, 48 ; Grant and La Touche, Ibis, 1907, p. 167.

Obtained in Apes' Hill, Takao.

Family TIMELIIDÆ.

178. **Trochalopteron taiwanum** (Swinh.)... .. **Hoibii*.

Sharpe, Cat. B. Br. Mus., VII, p. 377 ; La Touche, Ibis, 1895, p. 331 ; La Touche, Ibis, 1897, p. 357 ; Tada, Taiwan Chōrui Ippan, p. 15 ; Grant and La Touche, Ibis, 1907, p. 178 ; *Leucodioptrum taiwanum* Swinboe, P. Z. S., 1871, p. 371.

Specimens from :

Manka (Taihoku Distr.), Jan. 3, Feb. 13, April 25.

Shisangan (Taihoku Distr.), Sept. 4.

Ensui-kō (Ensui Distr.), June 4.

Suishsha (Nantō Distr.), Oct. 21.

Kodenshō (Kagi Distr.), Feb. 7.

Taiharō (Taitō Distr.), Oct. 15.

Hōwōzan (Toroku Distr.), Feb. & Mar.

179. **Trochalopteron morrisonianum** Grant... **Kinbane-hoibii*.

Grant, Bul. B. O. C. XVI, p. 120 ; Grant and La Touche, Ibis, 1907, p. 178 ; Grant, op. cit., 1908, p. 603.

Specimens from :

Arisan (Kagi Distr.), April 11, Nov. 16, 18, 20.

Niitakayama (Mt. Morrison), Jan.

180. **Pomatorhinus musicus** Swinh. . . . **Himemaruhashi*.

Swinhoe, P. Z. S., 1871, p. 370; Elwes, op. cit., 1873, p. 667; Sharpe, Cat. B. Br. M., vii, p. 424; La Touche, Ibis, 1895, p. 330; La Touche, op. cit., 1898, p. 358; Tada, Taiwan Chōrui Ippan, p. 15; Grant and La Touche, Ibis, 1907, p. 179; Grant, op. cit., 1908, p. 603.

Specimens from :

Manka (Taihoku Distr.), Mar. 19, April 25.

Shisangan (Taihoku Distr.), Aug. 27.

Basshishō (Taitō Distr.), Oct. 23.

Taiharō (Taitō Distr.), Oct. 16.

Shūshū (Nantō Distr.), Jan. 24, Dec. 21.

Rantaisan (Nantō Distr.), March 14.

Hōwōzan (Toroku Distr.), Feb. and March.

Ratō (Giiran Distr.).

Chūho (Banshoryō Distr.), Aug. 20.

Sanshiten (Kagi Distr.), Aug. 30, Oct. 10.

181. **Pomatorhinus erythrocnemis** Gould. . . . **Maruhashi*.

Swinhoe, P. Z. S., 1871, p. 370; Elwes, op. cit., 1873, p. 667; Sharpe, Cat. B. Br. M., vii, p. 427; La Touche, Ibis, 1895, pp. 311, 312, 331; Grant and La Touche, op. cit., 1907, p. 179.

Specimens from :

Horisha (Nantō Distr.), May 20.

Shishaban (Banshoryō Distr.), June 14.

Shamikisha, May 20.

Racu Racu Mts., January.

Hōwōzan (Toroku Distr.), March.

182. **Garrulax ruficeps** Gould. . . . **Chagashira*.

Swinhoe, P. Z. S., 1871, p. 371; Elwes, op. cit., 1873, p. 667;

Sharpe, Cat. B. Br. Mus., vii, p. 438; Tada, Taiwan Chōrui Ippan, p. 26; Grant and La Touche, Ibis, 1907, p. 180.

Obtained in Datetsu (Banshoryō Distr.), June 13, 14.

183. **Dryonastes pœcilorhynchus** (Gould). . . . **Takedori*.

Elwes, P. Z. S., 1873, p. 667; Sharpe, Cat. B. Br. Mus., vii, p. 460; Grant and La Touche, Ibis, 1907, p. 180; Grant, op. cit., 1908, p. 603.

Specimens from :

Arisan (Kagi Distr.), April 17.

Kōdenshō (Kagi Distr.), Mar. 15, 16.

Shishaban (Banshoryō Distr.), June 17.

Shamikisha, April 2.

Hōwōzan (Toroku Distr.), March.

Racu Racu Mts., Jan., Feb.

184. **Alcippe morrisonia** Swinh. . . . **Mejiro-chimedori*.

Swinhoe, P. Z. S., 1871, p. 374; Elwes, op. cit., 1873, p. 667; La Touche, Ibis, 1895, pp. 314, 321, 332; La Touche, op. cit., 1898, p. 358; Tada, Taiwan Chōrui Ippan, p. 22; Grant and La Touche, Ibis, 1907, p. 181; *Alcippe morrisoniana* Swinh., Sharpe, Cat. B. Br. Mus., vii, p. 621.

Specimens from :

Chūho (Banshoryō Distr.), Aug. 20.

Shūshū (Nantō Distr.), Dec. 24.

Tōshien (Tōshien Distr.), Mar. 1.

Kōdensho (Kagi Distr.), Mar. 7.

Hōwōzan (Toroku Distr.), March.

Racu Racu Mts., Jan. and Feb.

Banshiro (Kagi Distr.), April 17.

185. **Proparus formosanus** Grant. . . . **Arisan-chimedori*.

Bul. B. O. C. XVI, p. 120; Grant and La Touche, Ibis, 1907, p. 181; Grant, op. cit., 1908, p. 603.

Specimens from :

Niitakayama (Mt. Morrison), January.

Arisan (Kagi Distr.), Nov. 11, Dec. 1.

186. **Schoeniparus brunneus** (Gould) **Chimedorì*.

Grant and La Touche, Ibis, 1907, p. 181; *Alcippe brunnea* Gould, Swinhoe, P. Z. S., 1871, p. 374; Elwes, op. cit., 1873, p. 667; Sharpe, Cat. B. Br. Mus., vii, p. 624; La Touche, Ibis, 1895, pp. 311, 312, 332; La Touche, op. cit., 1898, p. 358; Tada, Taiwan Chōrui Ippan, p. 22; *Alcippe obscurior* Grant, Bul. B. O. C. XVI p. 121; op. cit., XIX, p. 14.

Specimens from :

Kōdensho (Kagi Distr.), Mar. 21.

Shūshū (Nantō Distr.), Dec. 23.

Hōwōzan (Toroku Distr.), Feb. & March.

Racu Racu Mts., Feb.

187. **Stachyridopsis præcognitus** (Swinh.)
**Zuaka-chimedorì*.

Grant and La Touche, Ibis, 1907, p. 183; *Stachyridopsis ruficeps* (Blyth.), La Touche, op. cit., 1895, pp. 314, 332; La Touche, 1898, op. cit., p. 358; Tada Taiwan Chōrui Ippan, p. 23.

Specimens from :

Sanshiten (Kagi Distr.), June 10, 11.

Racu Racu Mts., Jan. & Feb.

Tappansha, Feb. 21.

188. **Myiophoneus insularis** Gould. **Rurichō*.

Swinhoe, P. Z. S., 1871, p. 308; Elwes, P. Z. S., 1873, p. 667; Sharpe, Cat. B. Br. Mus., vii, p. 11; La Touche, Ibis, 1898, p. 357; Tada, Taiwan Chōrui Ippan, p. 18; Grant and La Touche, Ibis, 1907, p. 184; Grant, op. cit., 1908, p. 603.

Specimens from :

Giiran (Giiran Distr.), Sept. 5, 15, 20.

Rantaisan (Nantō Distr.).

Hōwōzan (Toroku Distr.), March.

189. **Malacias auricularis** (Swinh.) **Mimijirō-chimedorì*.

Sharpe, Cat. B. Br. Mus., vii, p. 405 ; Tada, Taiwan Chōrui Ippan, p. 19 ; Grant and La Touche, Ibis, 1907, p. 185 ; Grant, op. cit., 1908, p. 603 ; *Sibia auricularis* Swinhoe, P. Z. S., 1871, p. 370 ; Elwes, P. Z. S., 1873, p. 667 ; La Touche, Ibis, 1895, pp. 314, 321, 330.

Specimens from :

Tappansha, Feb. 16.

Shishaban (Banshoryō Distr.), July 17.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Arisan (Kagi Distr.), April 3.

Racu Racu Mts., Jan. and Feb.

190. **Actinodura morrisoniana** Grant. **Shimadori*.
Grant, Bul. B. O. C. XVI, p. 119 ; Grant and La Touche, Ibis, 1907, p. 185 ; Grant, op. cit., 1908, p. 604.

Specimens from :

Shishaban (Banshoryō Distr.), July 16.

Arisan (Kagi Distr.), April 12, Nov. 9, 18.

Niitakayama (Mt. Morrison), Jan.

191. **Yuhina brunneiceps** Grant. **Kammuri-chimcdori*.
Grant, Bul. B. O. C. XVI, p. 121 ; Grant and La Touche, Ibis, 1907, p. 186 ; Grant, op. cit., 1908, p. 604.

Specimens from :

Arisan (Kagi Distr.), April 6, 13, Dec. 2, 6.

Racu Racu Mts., Jan. and Feb.

192. **Herpornis tyrannulus** Swinh. **Ao-chimcdori*.
Swinhoe, P. Z. S., 1871, p. 373 ; Tada, Taiwan Chōrui Ippan, p. 27 ; Grant and La Touche, Ibis, 1907, p. 187.

Specimens from :

Sanshiten (Kagi Distr.), July 30.

Hōwōzan (Toroku Distr.), Feb.

Banshiro (Kagi Distr.), Aug. 30.

193. **Liocichla steeri** Swinh. **Yabudori*.
Swinhoe, Ibis, 1877, p. 474, Pl. XIV ; La Touche, op. cit., 1895,

pp. 321, 332; Grant and La Touche, Ibis, 1907, p. 188; Grant, op. cit., 1908, p. 604.

Specimens from :

Arisan (Kagi Distr.), April 12, 14, Nov. 20.

Hōwōzan (Toroku Distr.), Feb.

Racu Racu Mts., Jan. and Feb.

Tappansha, Jan. 20.

194. **Suthora bulomachus** Swinh. **Hashibuto-chimedor.*

Swinhoe, P. Z. S., 1871, p. 372; Elwes, op. cit., 1873, p. 667;

La Touche, Ibis, 1898, p. 361; Sharpe, Cat. B. Br. Mus., vii, p. 490;

Tada, Taiwan Chōrui Ippan, p. 25; Grant and La Touche, Ibis, 1907, p. 188.

Specimens from :

Rantaisan (Nantō Distr.), Mar. 16.

Kagi (Kagi Distr.), Sept. 6.

Shūshū (Nantō Distr.), Feb. 15.

195. **Suthora morrisoniana** Grant.

**Niitaka-hashibuto-chimedor.*

Grant, Bul. B. Br. Mus., xvi, p. 119; Grant and La Touche, Ibis, 1907, p. 188; Grant, op. cit., 1908, p. 604, Pl. XII, fig. 1.

Obtained in Niitakayama (Mt. Morrison), Jan.

FAMILY PYCNONOTIDÆ.

196. **Picnonotus taivanus** Styan. **Kurogashira.*

Styan, Ibis, 1893, p. 470; Styan, op. cit., 1894, p. 337, Pl. IX;

La Touche, Ibis, 1895, pp. 328, 329, 333; Tada, Taiwan Chōrui Ippan, p. 17; Grant and La Touche, Ibis, 1907, p. 189.

Specimens from :

Nankō (Kōshun Distr.).

Karenkō (Taitō Distr.), Sept. 29, 30.

197. **Picnonotus sinensis formosæ** Hart. **Shirogashira.*

Sharpe, Cat. B. Br. Mus., vi, p. 149; La Touche, Ibis, 1895, p.

333; La Touche, Ibis, 1898, p. 365; Tada, Taiwan Chōrui Ippan, p. 16; Grant and La Touche, Ibis, 1907, p. 189; Grant, op. cit., 1908, p. 604; Hartert, Nov. Zool., 1910, pp. 229, 230.

Specimens from :

Shisangan (Taihoku Distr.), Aug. 22, Sept. 7, 30.

Manka (Taihoku Distr.), Feb. 11.

Kagi (Kagi Distr.), Nov. 11.

Kōdenshō (Kagi Distr.), Mar. 2.

Shūshū (Nantō Distr.), Jan. 23, Feb. 21.

Rantaisan (Nantō Distr.), Mar. 14, 16.

198. **Hypsipetes nigerrimus** Gould. **Kuro-hiyodori*.

Swinhoe, P. Z. S., 1871, p. 369; Elwes, op. cit., 1873, p. 667; Sharpe, Cat. B. Br. Mus., vi, p. 41; La Touche, Ibis, 1895, pp. 314, 321, 324, 333; La Touche, op. cit., 1898, p. 365; Tada, Taiwan Chōrui Ippan, p. 13; Grant and La Touche, Ibis, 1907, p. 189.

Specimens from :

Shūshū (Nantō Distr.), Feb. 8.

Rantaisan (Nantō Distr.), Mar. 14.

Shisangan (Taihoku Distr.), Aug. 23, Sept. 29.

Hokusan (Toroku Distr.), Feb. 17, Nov. 4.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Taimari (Taitō Distr.), Aug. 26.

Kodenshō (Kagi Distr.), Mar. 9.

Banshiro (Kagi Distr.), Aug. 27.

Shamikisha, April 7.

Tappansha, Jan. 29.

*199. **Hypsipetes amaurotis stejnegeri** Hart.

Ishigaki-hiyodori.

Hypsipetes sp.? Tada, Taiwan Chōrui Ippan, p. 12.

Obtained in Kōtōsho (Pescadores Il.), May and Dec. 14.

200. **Spizixus cinereicapillus** Swinh. **Kayanobori*.

Swinhoe, P. Z. S., 1871, p. 370; Elwes, op. cit., 1873, p. 667;

La Touche, Ibis, 1895, pp. 320, 333; Grant and La Touche, op. cit., 1907, p. 190; *Spizixus cinericeps* La Touche, Ibis, 1895, pp. 325, 333.

Specimens from :

Kōdenshō (Kagi Distr.), Mar. 9, 17.

Shūshū (Nantō Distr.), Dec. 22.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Racu Racu Mts., Feb.

Tappansha, Jan. 28, Feb. 12.

Family MUSCICAPIDÆ.

201. **Hemichelidon sibirica** (Gmel.) *Samcebitaki*.

La Touche, Ibis, 1898, p. 367; Grant and La Touche, op. cit., 1907, p. 191.

Specimens from :

Hokusan (Toroku Distr.), Nov. 4.

Taiharō (Taitō Distr.), Oct. 16.

Tansui (Taihoku Distr.), Nov. 4.

202. **Hemichelidon ferruginea** Hodgs.

Grant, Ibis, 1908, p. 604.

Obtained in Arisan (Kagi Distr.), April 7.

203. **Alseonax latirostris** (Raffl.) *Kosamcebitaki*.

Grant and La Touche, Ibis, 1907, p. 191.

204. **Muscicapa luteola** (Pall.) *Mugimaki*.

Poliomyias luteola (Pall.), Grant and La Touche, Ibis, 1907, p. 192; *Siphia luteola* (Pall.), Tada, Taiwan Chōrui Ippan, p. 8; *Erythrosterina luteola* (Pall.), Swinhoe, P. Z. S., 1871, p. 380.

205. **Muscicapa griseisticta** (Swinh.) *Yesobitaki*.

Grant and La Touche, Ibis, 1907, p. 191.

206. **Niltava cyanomelæna** (Temm.) *Ōruri*.

La Touche, Ibis, 1898, p. 367; *Cyanoptila cyanomelæna* (Temm.), Tada, Taiwan Chōrui Ippan, p. 8; Grant and La Touche, Ibis, 1907, p. 193.

Specimens from :

Hokusan (Toroku Distr.), Oct. 28.

Tansui (Taihoku Distr.), Oct. 28.

207. **Cyornis vivida** Swinh. **Chabara-ōruri*.

Swinhoe, P. Z. S., 1871, p. 380; Grant and La Touche, Ibis, 1907, p. 191; *Niltava vivida* (Swinh.), Sharpe, Cat. B. Br. Mus., iv, p. 463; Tada, Taiwan Chōrui Ippan, p. 81.

Specimens from :

Hōwōzan (Toroku Distr.), Feb. and Mar.

Racu Racu Mts., Jan. and Feb.

Tappansha, Feb. 22.

208. **Muscicapa hyperythra** (Blyth). **Mamijiro-hitaki*.

Grant and La Touche, Ibis, 1907, p. 192; *Digenia superciliaris* Horst. & Moore, Swinhoe, P. Z. S., 1871, p. 381; Tada, Taiwan Chōrui Ippan, p. 9.

Obtained in Hōwōzan (Toroku Distr.), Feb.

209. **Xanthopygia affinis** Grant. **Kawabitaki*.

Grant, Bul. B. O. C. XVI, p. 118; Grant and La Touche, Ibis, 1907, p. 192; *Rhyacornis fuliginosa* La Touche, op. cit., 1898, p. 362.

Specimens from :

Gyochi, Horisha (Nantō Distr.), Dec. 14.

Tappansha, Dec. 26.

Racu Racu Mts., Jan. and Feb.

210. **Hypothymis azurea** (Bodd.). **Kuroeri-hitaki*.

La Touche, Ibis, 1893, p. 367; Grant and La Touche, op. cit., 1907, p. 193; *Myiagra azurca* (Bodd.), Swinhoe, P. Z. S., 1871, p. 381; La Touche, Ibis, 1895, p. 334; *Hypothymis azurea* (Bodd.), La Touche; op. cit., p. 367; *Hypothymis occipitalis* Vig., Tada, Taiwan Chōrui Ippan p. 9.

Specimens from :

Taimari (Taitō Distr.), Aug. 27.

Taitō (Taitō Distr.).

Taiharō (Taitō Distr.), Oct. 16.

Chūho (Banshoryō Distr.), Aug. 7.

Suikutto (Kagi Distr.), Sept. 8.

Hokusankō (Nantō Distr.), May 28.

Shūshū (Nantō Distr.), Dec. 21.

Hōwōzan (Toroku Distr.), March.

211. **Terpsiphone princeps**; (Temm.) *Sankōchō*.

Grant and La Touche, Ibis, 1907, p. 193.

Obtained in Tansui (Taihoku Distr.), April and May.

*212. **Terpsiphone nigra** McGregor. **Kuro-sankōchō*.

Terpsiphone corvina E. Newton?, Tada, Taiwan Chōrui Ippan,

p. 11.

Obtained in Kōtōsho (Pescadores IIs.), May.

213. **Cryptolopha fulvifacies** (Swinh.).

Grant and La Touche, Ibis, 1907, p. 193; *Abornis fulvifacies*

Swinh., Elliot, P. Z. S., 1870, p. 132.

Obtained in Racu Racu Mts., Feb.

FAMILY TURDIDÆ.

Subfamily Turdinæ.

214. **Turdus fuscatus** Pall. *Tsugumi*.

Swinhoe, P. Z. S., 1871, p. 366; Grant and La Touche, Ibis,

1907, p. 173.

Obtained in Kobi, Feb. 7.

215. **Turdus naumanni** Temm. *Hachijō-tsugumi*.

Tada, Taiwan Chōrui Ippan, p. 3; Grant and La Touche, Ibis,

1907, p. 173.

Specimens from :

Keibikai, Jan. 27.

Tansui (Taihoku Distr.), Feb. 19.

216. **Turdus chrysolaus** Temm... .. *Akahara.*

Swinhoe, P. Z. S., 1871, p. 367 ; Tada, Taiwan Chōrui Ippan, p. 2 ;
Grant and La Touche, Ibis, 1907, p. 174 ; *Merula chrysolaus* (Temm.),
Seebohm, Cat. B. Br. Mus., v, p. 275 ; La Touche, Ibis, 1898, p. 356.

Specimens from :

Manka (Taihoku Distr.), Mar. 25.

Shisangan (Taihoku Distr.), Sept. 20.

Tappansha, Jan. 3.

Hokusan (Toroku Distr.), Mar. 19.

Saikichisho (Pescadores IIs.), March.

217. **Turdus obscurus** Gmel. *Mamichajinai.*

Tada, Taiwan Chōrui Ippan, p. 3, Grant and La Touche, Ibis,
1907, p. 174 ; Grant, op. cit., 1908, p. 602 ; *Merula obscura* (Gmel.),
La Touche, Ibis, 1898, p. 356.

Specimens from :

Arisan (Kagi Distr.), April 14.

Tappansha, Feb. 21.

218. **Turdus pallidus** Gmel... .. *Shirohara.*

Swinhoe, P. Z. S., 1871, p. 367 ; Tada, Taiwan Chōrui Ippan,
p. 2 ; Grant and La Touche, Ibis, 1907, p. 173 ; *Merula pallida*
(Gmel.), La Touche, op. cit., 1895, p. 330 ; La Touche, op. cit., 1898,
p. 356.

Specimens from :

Manka (Taihoku Distr.), Feb. 13.

Hokusan (Toroku Distr.), Feb. 19.

Taikokan (Taihoku Distr.), Jan. 27.

Tappansha, Feb. 16.

219. **Turdus albiceps** Swinh. **Taiwan-tsugumi.*

Swinhoe, P. Z. S., 1871, p. 367 ; Elwes, P. Z. S., 1873, p. 667 ;
Tada, Taiwan Chōrui Ippan, p. 3 ; Grant and La Touche, 1907, p.
174 ; Grant, op. cit., 1908, p. 602 ; *Merula albiceps* (Sw.), Seebohm
Cat. B. Br. Mus., v, p. 259 ; La Touche, Ibis, 1895, pp. 325, 329, 330.

Specimens from :

Rantaisan (Nantō Distr.), Mar. 13.

Dachō (Banshoryō Distr.), July 9.

220. **Geocichla varia** (Pall.). *Toratsugumi*.

La Touche, Ibis, 1898, p. 357 ; Tada, Taiwan Chōrui Ippan, p. 1 ;
Oreocinchla varia (Pall.), Swinhoe, P. Z. S., p. 367 ; Grant and La
 Touche, Ibis, 1907, p. 174 ; Grant, op. cit., p. 602.

Specimens from :

Shisangan (Taihoku Distr.), Nov. 20.

Hokusan (Toroku Distr.), Mar. 15. Nov. 4.

Rantaisan (Nantō Distr.), Mar. 10.

Niitakayama (Mt. Morrison), Jan.

Tōkichisho (Pescadores IIs.), March.

221. **Monticola solitarius** (Müller). *Isohiyodori*.

La Touche, Ibis, 1895, p. 331 ; La Touche, op. cit., 1898, p. 357 ;
Monticola manilla (Bodd.), Grant and La Touche, Ibis, 1907, p. 174 ;
Petrocincla manilla (Bodd.), Swinhoe, P. Z. S., 1871, p. 368.

Specimens from :

Karenkō (Taitō Distr.), Sept. 30.

Tailharō (Taitō Distr.), Oct. 15.

Taitonsan (Taihoku Distr.).

Taikokan (Taihoku Distr.), Jan.

Hōwōzan (Toroku Distr.), March.

Suisha (Nantō Distr.), Oct. 4.

Tappansha, Jan. 20.

Hakusato (Pescadores IIs.), Jan.

222. **Ruticilla aurea** (Pall.). *Jōbitaki*.

Swinhoe, P. Z. S., 1871, p. 358 ; La Touche, Ibis, 1895, p. 331 ;
 La Touche, op. cit., 1898, p. 363 ; Grant and La Touche, op. cit.,
 1907, p. 175.

Obtained in Kobi.

223. **Fratincola maura** (Pall.). *Nobitaki*.

Grant and La Touche, Ibis, 1907, p. 177; *Pratincola indica* Blyth, Swinhoe, P. Z. S., 1871, p. 360.

224. **Calliope camtschatkensis** (Gmel.) *Nogoma*.

La Touche, Ibis, 1895, p. 331; Tada, Taiwan Chōrui Ippan, p. 4; Grant and La Touche, Ibis, 1907, p. 175.

Specimens from :

Manka (Taihoku Distr.), Mar. 12.

Kagi (Kagi Distr.), Jan.

Saikichisho (Pescadores IIs.), March.

225. **Ianthia cyanura** (Pall.) *Ruribitaki*.

Swinhoe, P. Z. S., 1871, p. 359; Tada, Taiwan Chōrui Ippan, p. 4; Grant and La Touche, Ibis, 1907, p. 175; *Tarsiger cyanurus* (Pall.), La Touche, Ibis, 1898, p. 367.

Obtained in Niitakayama (Mt. Morrison), Jan.

226. **Ianthia jhcnstoninæ** Grant **Arisan-hitaki*.

Grant, Bull. B. O. C. XVI, p. 118; Grant and La Touche, Ibis, 1907, p. 175; Grant, op. cit., 1908, p. 603.

Specimens from :

Arisan (Kagi Distr.), April 11, Nov. 10, Dec. 12.

Rantaisan (Nantō Distr.), Mar. 7.

Niitakayama (Mt. Morrison), Jan.

227. **Notodela montium** (Swinh.) **Konhitaki*.

Swinhoe, P. Z. S., 1871, p. 359; Sharpe, Cat. B. Br. Mus., vii, p. 24; La Touche, Ibis, 1895, pp. 321, 323, 331; Tada, Taiwan Chōrui Ippan, p. 20; Grant and La Touche, Ibis, 1907, p. 176; Grant, op. cit., 1908, p. 603.

Specimens from :

Kōdenshō (Kagi Distr.), Mar. 11, 17.

Arisan (Kagi Distr.), April 4.

Rantaisan (Nantō Distr.), Mar. 13.

Shūshū (Nantō Distr.), Dec. 22.

228. **Microcichla scouleri** (Vigors.) **Shirokuro hitaki*.

Sharpe, Cat. B. Br. Mus., vii, p. 322; Grant and La Touche, Ibis, 1907, p. 175.

Specimens from :

Horisha (Nantō Distr.), Jan. 11.

Ranrei (Giiran Distr.), Sept. 15.

Niitakayama (Mt. Morrison), Jan.

Subfamily Sylviinæ.

229. **Acrocephalus orientalis** (Temm. & Schl.). .. *Ōyoshikiri*.
Grant and La Touche, Ibis, 1907, p. 170

230. **Cisticola volitans** (Swinh.).. .. **Taiwan-sekka*.
Swinhoe, P. Z. S., 1871, p. 352; Grant and La Touche, Ibis, 1907, p. 171; *Cisticola exilis* (Vig. & Horsf.), La Touche, op. cit., 1898, p. 361; Tada, Taiwan Chōrui Ippan, p. 24.

Specimens from :

Sanshiten (Kagi Distr.), July 31.

Tansui (Taihoku Distr.), Jan. 28, May 1, 17, Nov. 25, Dec 16.

231. **Cisticola cisticola** (Temm.).. .. *Sekka*.
Grant and La Touche, Ibis, 1907, p. 171; *Cisticola cursitans* Frankl., La Touche, op. cit., 1898, p. 361; *Cisticola schwanicola* Bp., Swinhoe, P. Z. S., 1871, p. 352.

Obtained in Hokusai (Toroku Distr.), April 28.

232. **Luscinola fuscata** (Blyth.).

Grant and La Touche, Ibis, 1907, p. 170; *Phyllopneste fuscata* (Blyth.), Swinhoe, P. Z. S., 1871, p. 356.

233. **Urosphena squamiceps** (Swinh.).. .. *Yabusame*.

Grant and La Touche, Ibis, 1907, p. 172; *Tribura squamiceps* Swinhoe, P. Z. S., 1871, p. 355; *Horornis squamiceps* (Swinhoe), La Touche; Ibis, 1895, p. 331; La Touche, op. cit., 1898, p. 363.

Obtained in Tansui (Taihoku Distr.), Oct. 28, Dec. 2.

234 **Horornis robustipes** (Swinh.).. .. **Taiwan-konguisu*.

Grant and La Touche, Ibis, 1907, p. 171; *Horeites robustipes*

Swinhoe, P. Z. S., 1871, p. 351; Elwes, op. cit., 1873, p. 667.

235. **Horornis canturians** (Swinh.) **Taiwan-uguisu*.

Grant and La Touche, Ibis, 1907, p. 172; *Cettia canturiens* Swinh., La Touche, Ibis, 1895, p. 332; La Touche, op. cit., 1898, p. 363; Tada, Taiwan Chōrui Ippan, p. 6; *Cettia cantans minuta* (Temm. & Schl.), ibid, p. 6; *Cettia minuta* (Swinh.), La Touche, Ibis, 1898, p. 363; Tada, Taiwan Chōrui Ippan, p. 6; *Harvivox canturiens* (Swinhoe), P. Z. S., 1871, p. 353; *Hervivox minuta* (Swinhoe), ibid, p. 353.

Specimens from :

Manka (Taihoku Distr.), Mar. 23, April 25.

Taikokan (Taihoku Distr.), Jan.

Gyochi (Nantō Distr.), Dec. 13, 14.

Kobi, March.

236. **Phylloscopus superciliosus** (Gmel.).

Grant and La Touche, Ibis, 1907, p. 171; *Reguloides superciliosus* (Gmel.), Swinhoe, P. Z. S., 1871, p. 357.

*237. **Phylloscopus xanthodryas** Swinh. *Meboso*.
Obtained in Banshiro (Kagi Distr.), Aug. 29, Sept. 1.

238. **Phylloscopus borealis** (Blas.) *Komushikui*.

La Touche, Ibis, 1898, p. 363; Tada, Taiwan Chōrui Ippan, p. 7; Grant and La Touche, Ibis, 1907, p. 171; *Phyllopneuste borealis* Blasius, Swinhoe, P. Z. S., 1871, p. 356.

Specimens from :

Tansui (Taihoku Distr.), Jan.

Taimari (Taitō Distr.), Aug. 26.

Tainan (Tainan Distr.), Oct.

239. **Phylloscopus coronatus** (Temm.) *Sendai-mushikui*.

Grant and La Touche, Ibis, 1907, p. 171.

*240. **Regulus cristatus orientalis** Seeb. . . . *Kikuitadaki*.

241. **Regulus gcodfellowi** Grant **Niitaka-kikuitadaki*.

Grant, Bul. B. O. C. XVI, p. 122; Grant and La Touche, Ibis, 1901, p. 167, Pl. III.

Obtained in Nītakayama (Mt. Morrison), Jan.

242. **Suya crinigera** Hodgs.

La Touche, Ibis, 1898, p. 359; Tada, Taiwan Chōrui Ippan, p. 23; Grant and La Touche, Ibis, 1907, p. 172.

Specimens from :

Taihoku (Taihoku Distr.), Dec. 25.

Kagi (Kagi Distr.), July 24.

Banshiro (Kagi Distr.), April 16.

Kodenshō (Kagi Distr.), Mar. 23.

Shūshū (Nantō Distr.), Mar. 23.

Hōwōzan (Toroku Distr.), Mar.

Hokusan (Toroku Distr.), April 7, 28.

243. **Prinia extensicauda** (Swinh.).

Sharpe, Cat. B. Br. Mus., vii, p. 199; Grant and La Touche, Ibis, 1907, p. 173; *Prinia inornata* Sykes, La Touche, Ibis, 1895, p. 331; La Touche, op. cit., 1898, p. 360; Tada, Taiwan Chōrui Ippan, p. 21; *Drymæpus extensicauda* Swinhoe, P. Z. S., 1871, p. 351.

Obtained in Kōdenshō (Kagi Distr.), Mar. 18, 25.

244. **Burnesia sonitans** (Swinh.).

Sharpe, Cat. B. Br. Mus., vii, p. 205; Grant and La Touche, Ibis, 1907, p. 173; *Prinia sonitans* Swinhoe, P. Z. S., 1871, p. 351; La Touche, Ibis, 1895, p. 331; La Touche, op. cit., 1898, p. 359; Tada, Taiwan Chōrui Ippan, p. 21.

Obtained in Tansui (Taihoku Distr.), June 23.

Family **CINCLIDÆ**.

245. **Cinclus marila** (Swinh.). *Kawagarasu*.

La Touche, Ibis, 1898, p. 362; Grant and La Touche, op. cit., 1907, p. 177; *Hydrobata pallasii* Temm., Swinhoe, P. Z. S., 1871, p. 368; Tada, Taiwan Chōrui Ippan, p. 19.

Specimens from :

Tappansha, Sept. 10.

Taikokan (Taihoku Distr.), Jan. and Mar.

Family **TROGLODYTIDÆ**.

246. **Anorthura fumigata** (Temm.). *Misosazai*.

Grant and La Touche, Ibis, 1907, p. 177.

Obtained in Niitakayama (Mt. Morrison), Jan.

Family **HIRUNDINIDÆ**.

247. **Hirundo striolata** Boie... *Ōkoshiaka-tsubame*.

La Touche, Ibis, 1898, p. 367; Tada, Taiwan Chōrui Ippan, p. 54;

Grant and La Touche, Ibis, 1907, p. 193; *Cecropis striolata* Swinhoe, P. Z. S., 1871, p. 346; *Hirundo nipalensis*? La Touche, Ibis, 1895, p. 334; *Hirundo substriolata* Hume, Sharpe, Cat. B. Br. Mus., x, p. 163.

Specimens from :

Shūshū (Nantō Distr.), Feb. 12, 23.

Naihoshisho, June 12.

248. **Hirundo gutturalis** (Scop.)... *Tsubame*.

Sharpe, Cat. B. Br. Mus., x, p. 134; La Touche, Ibis, 1895, p. 334; La Touche, op. cit., 1898, p. 367; Grant and La Touche, op. cit., 1907, p. 194; *Hirundo rustica gutturalis* (Scop.), Tada, Taiwan Chōrui Ippan, p. 54.

Specimens from :

Shūshū (Nantō Distr.), Jan. 16, Dec. 30.

Kagi (Kagi Distr.), Oct. 20.

Taitokōshō, Aug. 7.

249. **Cotile riparia** (L.). *Sunamuguri-tsubame*.

Tada, Taiwan Chōrui Ippan, p. 54; *Cotile sinensis* (J. E. Gray), Sharpe, Cat. B. Br. Mus., x, p. 104; La Touche, Ibis, 1895, p. 335; La Touche, op. cit., 1898, p. 367; Grant and La Touche, op. cit., 1907, p. 194.

Specimens from :

Taikokan (Taihoku Distr.), Feb. 21.

Taihoku (Taihoku Distr.).

Family **CAMPEPHAGIDÆ**.

250. **Pericrocotus griseigularis** Gould. **Beni-sanshokui*.

La Touche, Ibis, 1895, p. 334; Tada, Taiwan Chōrui Ippan, p. 39; Grant and La Touche, Ibis, 1907, p. 190.

Specimens from :

Shūshū (Nantō Distr.), Dec. 24.

Hokusankō (Nantō Distr.), May 28.

Kodenshō (Kagi Distr.), Mar. 11, 17.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Racu Racu Mts., Jan. and Feb.

251. **Pericrocotus cinereus** Lafres. *Sanshokui*.

Tada, Taiwan Chōrui Ippan, p. 39; Grant and La Touche, Ibis, 1907, p. 190.

Specimens from :

Shisangan (Taihoku Distr.), Sept. 22.

Taisho (Pescarodes Ils.), April.

Tainan (Tainan Distr.), Sept. 5.

252. **Graucalus rex-pineti** Swinh. **Oni-sanshokui*.

Sharpe, Cat. B. Br. Mus., IV, p. 35; Tada, Taiwan Chōrui Ippan, p. 39; Grant and La Touche, Ibis, 1907, p. 190.

Specimens from :

Hokusankō (Nantō Distr.), Dec. 15.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Family **DICRURIDÆ**.

253. **Chaptia brauniana** Swinh. **Hime-ōchū*.

Elwes, P. Z. S., 1873, p. 667; Tada, Taiwan Chōrui Ippan, p. 34; Grant and La Touche, Ibis, 1907, p. 161; Grant, op. cit., 1908, p. 601.

Specimens from :

Banshiro (Kagi Distr.), April 4.

Kōdenshō (Kagi Distr.), Mar. 21.

Sanshiten (Kagi Distr.), Sept. 1.

Hōwōzan (Toroku Distr.), March.

Rantaisan (Nantō Distr.), Mar. 13, 14.

Racu Racu Mts., Jan.

254. **Buchanga atra** (Herm.)... .. **Ōchū*.

Sharpe, Cat. B. Br. Mus., iii, p. 246; La Touche, Ibis, 1895, pp. 306, 334; La Touche, op. cit., 1898, p. 601; Grant and La Touche, op. cit., 1907, p. 161; Grant, op. cit., 1908, p. 601; *Dicrurus cathæcus* Swinhoe, P. Z. S., 1871, p. 377.

Specimens from :

Kagi (Kagi Distr.), Nov. 2.

Sanshiten (Kagi Distr.), Sept. 1, Oct. 20.

Shisangan (Taihoku Distr.), Sept. 3, 9, 20.

Rantaisan (Nanto Distr.), Mar. 11, 18.

Family AMPELIDÆ.

255. **Ampelis japonicus** (Siebold). *Hirenjaku*.

Grant and La Touche, Ibis, 1907, p. 170; *Ampelis phœnicoptera* Temm, Swinhoe, P. Z. S., 1871, p. 374.

Obtained in Tansui (Taihoku Distr.), April 17.

Family LANIIDÆ.

256. **Lanius schach** (L.)... .. **Takasago-mozu*.

Swinhoe, P. Z. S., 1871, p. 375; La Touche, Ibis, 1895, p. 334; La Touche, op. cit., 1898, p. 366; Tada, Taiwan Chōrui Ippan, p. 36; Grant and La Touche, Ibis, 1907, p. 170.

Specimens from :

Basshishō (Taitō Distr.), Oct. 23, 24, 25.

Harōei (Taitō Distr.), Sept. 2, 4, 6.

Shūshū (Nantō Distr.), Jan. 23, 31.

Rantaisan (Nantō Distr.), Mar. 18.

Ratō (Giiran Distr.), Nov. 6.

Shisangan (Taihoku Distr.), Sept. 7.

257. **Lanius lucionensis** (L.) *Shima-mozu.*

Swinhoe, P. Z. S., 1871, p. 376; La Touche, Ibis, 1895, p. 334;

La Touche, op. cit., 1898, p. 366; Tada, Taiwan Chōrui Ippan, p. 37;

Grant and La Touche, Ibis, 1907, p. 170.

Specimens from :

Sanshiten (Kagi Distr.), Sept. 18, 19, Oct. 20.

Shūshū (Nantō Distr.), Jan. 12.

Tansui (Taihoku Distr.), Feb. 23.

Suigiureki, Sept. 15.

Taisho (Pescadores IIs.), March.

Family SITTIDÆ.

258. **Sitta sinensis** Verr. **Chabara-gojiukara.*

Grant and La Touche, Ibis, 1907, p. 167; Grant, op. cit., 1908, p. 602; *Sitta europæa sinensis* (Verr.), Hellmayr, Tierreich, Sittidæ p. 179.

Specimens from :

Shishaban (Banshoryō Distr.), July 15.

Rantaisan (Nantō Distr.), Mar. 8, 10.

Racu Racu Mts., Jan.

Family PARIDÆ.

259. **Machlolophus holsti** (Seeb.) **Taiwan-sijiukara.*

Grant and La Touche, Ibis, 1907, p. 168; *Parus holsti* Seeböhm, Bul. B. O. C., IV, p. vii; Ibis, 1895, pp. 146, 211, Pl. vi; Tada, Taiwan Chōrui Ippan, pp. 28, 29.

Specimens from :

Arisan (Kagi Distr.), April.

Racu Racu Mts., Jan. and Feb.

260. **Parus insperatus** Swinh. **Kibara-shijiukara*.

Swinhoe, P. Z. S., 1871, p. 361; Elwes, op. cit., 1873, p. 667; Tada, Taiwan Chōrui Ippan, p. 29; Grant and La Touche, Ibis, 1907, p. 169; *Parus insperatus?* La Touche, op. cit., 1895, pp. 322, 332; *Parus monticolus insperatus* (Swinh.), Hellmayr, Tierreich, Paridæ, p. 99.

Specimens from :

Rantaisan (Nantō Distr.), Mar. 8.

Racu Racu Mts., Jan. & Feb.

261. **Parus castaneiventris** Gould. **Taiwan-yamagara*.

Swinhoe, P. Z. S., 1871, p. 361; Elwes, op. cit., 1873, p. 667; Tada, Taiwan Chōrui Ippan, p. 29; Grant and La Touche, Ibis, 1907, p. 169; *Parus varius castaneiventris* (Gould), Hellmayr, Tierreich, Paridæ, p. 84.

262. **Ægithalus concinnus** (Gould). **Zuaka-gara*.

Grant and La Touche, Ibis, 1907, p. 169; Hellmayr, Tierreich, Paridæ, p. 122.

Obtained in Racu Racu Mts., Jan.

Family ORIOLIDÆ.

263. **Oriolus indicus** Jerd. **Kōrai-uguisu*.

Grant and La Touche, Ibis, 1907, p. 161; *Oriolus diffusus* Sharpe, Cat. B. Br. Mus., iii, p. 197; La Touche, Ibis, 1895, pp. 324, 328, 333; La Touche, op. cit., 1898, p. 366; Tada, Taiwan Chōrui Ippan, p. 35.

Specimens from :

Taiharō (Taitō Distr.), Oct. 16.

Taimari (Taitō Distr.), Aug. 28.

Sanshiten (Kagi Distr.), Aug. 18, Oct. 4, 8.

Shisangan (Taihoku Distr.), Sept. 4, 30.

Chūho (Banshoryō Distr.), Aug. 12.

264. **Oriolus ardens** (Swinh.) **Higoromo*.

Tada, Taiwan Chōrui Ippan, p. 36; Grant and La Touche, Ibis 1907, p. 161; Grant, op. cit., 1908, p. 601.

Specimens from :

Horisha (Nantō Distr.), May 20.

Rantaisan (Nantō Distr.), Mar. 11.

Hōwōzan (Toroku Distr.), Feb. and Mar.

Datetsusan (Banshoryō Distr.), July 10.

Family PLOCEIDÆ.

265. **Uroloncha acuticauda** (Hodgs.) **Koshijiro-kinpara*.

Sharpe, Cat. B. Br. Mus., xiii, p. 356; Grant and La Touche, Ibis, 1907, p. 162; *Munia acuticauda* Swinhoe, P. Z. S., 1871, p. 385; La Touche, Ibis, 1895, p. 335; La Touche, op. cit., 1898, p. 369; Tada, Taiwan Chōrui Ippan, p. 53; *Uroloncha squamicollis* Sharpe, Cat. B. Br. Mus., xiii, p. 359, part.

Specimens from :

Kagi (Kagi Distr.), Sept. 4, Oct. 9.

Hokutō (Taihoku Distr.), Sept. 14.

Tappansha, Feb. 22.

Racu Racu Mts. Feb.

266. **Munia topela** Swinh. **Shima-kinpara*.

Sharpe, Cat. B. Br. Mus., xiii, p. 351; La Touche, Ibis, 1895, p. 335; La Touche, op. cit., 1898, p. 369; Tada, Taiwan Chōrui Ippan, p. 52; Grant and La Touche, Ibis, 1907, p. 162.

Specimens from :

Kagi (Kagi Distr.), Nov. 29.

Shisangan (Taihoku Distr.), Aug. 8.

Hokutō (Taihoku Distr.), Sept. 14.

Dabyō (Toroku Distr.), July 29.

267. **Munia formosana** Swinh. **Taiwan-kinpara*.

Sharpe, Cat. B. Br. Mus. xiii, p. 338; La Touche, Ibis, 1895, p.

335; Tada, Taiwan Chōrui Ippan, p. 53; Grant and La Touche, Ibis, 1907, p. 162.

Specimens from :

Shūshū (Nantō Distr.), Feb. 29.

Dakusuisho (Giiran Distr.), Mar. 26.

Family **CORVIDÆ**.

268. **Corvus macrorhynchus levaillanti** Less. . .

Riukiu-hashibutogarasu.

Tada, Taiwan Chōrui Ippan, p. 30; *Corvus macrorhynchus* Wagl., La Touche, Ibis, 1898, p. 370; Grant and La Touche, op. cit., 1907, p. 158.

Specimens from :

Taihoku (Taihoku Distr.), March.

Gyochi (Nantō Distr.), Nov. 9.

Taimari (Taitō Distr.), Aug. 31.

Ratō (Giiran Distr.), Nov. 6.

269. **Pica pica** (L.). *Kasasagi.*

Grant and La Touche, Ibis, 1907, p. 159; Grant, op. cit., 1908, p. 601; *Pica media* Blyth, Swinhoe P. Z. S., p. 382; *Pica caudata* Keys. & Blas., La Touche, Ibis, 1895, p. 335; *Pica caudata* Ger., Tada, Taiwan Chōrui Ippan, p. 31.

Specimens from :

Shūshū (Nantō Distr.), Jan. 8, Feb. 11, 15, 16.

Rantaisan (Nantō Distr.), Mar. 18.

Sanshiten (Kagi Distr.), Nov. 25.

Giūchōkei (Kagi Distr.), Oct. 24.

Tainan (Tainan Distr.), Sept. 5.

270. **Urocissa caerulea** Gould. **Yamanusume.*

Swinhoe, P. Z. S., 1871, p. 382; Elwes, op. cit., 1873, p. 667; Sharpe, Cat. B. Br. Mus., iii, p. 74; La Touche, Ibis, 1895, p. 336; La Touche, op. cit., 1898, p. 370; Tada, Taiwan Chōrui Ippan, p. 31; Grant and La Touche, 1907, p. 371; Grant, op. cit., 1908, p. 601.

Specimens from :

Suisha (Nantō Distr.), Oct. 1.

Shūshū (Nantō Distr.), Jan. 15.

Rantaisan (Nantō Distr.), Mar. 15.

Hōwōzan (Toroku Distr.), Mar.

Racu Racu Mt., Jan.

271. **Dendrocitta formcsæ** Swinh. **Taiwan-onagadori*.

Swinhoe, P. Z. S., 1871, p. 382; Elwes, P. Z. S., 1873, p. 667; La Touche, Ibis, 1895, pp. 320, 321-323, 336; La Touche, op. cit., 1898, p. 370; Tada Taiwan Chōrui Ippan, p. 32; Grant and La Touche, Ibis, 1907, p. 159.

Specimens from :

Basshishō (Taitō Distr.), Oct., 24.

Taimari (Taitō Distr.), Aug. 23.

Taihoku (Taihoku Distr.), July 29.

Shisangan (Taihoku Distr.), July 2.

Suisha (Nantō Distr.), Oct. 24.

Sanshiten (Kagi Distr.), Oct. 27.

Hōwōzan (Toroku Distr.), Mar.

272. **Garrulus taivanus** Gould. **Takasago-kakesu*.

Swinhoe, P. Z. S., 1871, p. 361; Elwes, op. cit., 1873, p. 667; Tada, Taiwan Chōrui Ippan, p. 30; Grant and La Touche, Ibis, 1907, p. 160.

Specimens from :

Rantaisan (Nantō Distr.), Mar. 6, 9, 11.

Niitakayama (Mt. Morrison), Jan.

Racu Racu Mt., Jan., Feb.

Family **STURNIDÆ**.

273. **Acridotheres cristatellus** (L.). **Kāren*.

Sharpe, Cat. B. Br. Mus., xiii, p. 92; La Touche, Ibis, 1895, p. 335; La Touche, op. cit., 1898, p. 369; Tada, Taiwan Chōrui Ippan, p. 40; Grant and La Touche, Ibis, 1907, p. 160; Grant, op. cit., 1908, p. 601.

Specimens from :

Shūshū (Nantō Distr.), Feb. 4, 8.

Rantaisan (Nantō Distr.), Mar.

Banshiro (Kagi Distr.), April 24.

Kiirun (Kiirun Distr.), Mar. 29.

Inzan (Giiran Distr.), Sept., Nov. 2.

274. **Spodiopsar cineraceus** (Temm.) *Mukudori*.

Grant and La Touche, Ibis, 1907, p. 160; *Sturnus cineraceus*

Temm., La Touche, Ibis, 1898, p. 369; *Poliopsar cineraceus* (Temm.),

Sharpe, Cat. B. Br. Mus., xiii, p. 41.

Specimens from :

Taihoku (Taihoku Distr.), July 29.

Shisangan (Taihoku Distr.), Nov. 15.

Toroku (Toroku Distr.), Sept.

275. **Sturnia sinensis** (Gmel.) *Kara-mukudori*.

Sharpe, Cat. B. Br. Mus., xiii, p. 68; La Touche, Ibis, 1895, p.

335; Tada, Taiwan Chōrui Ippan, p. 41; Grant and La Touche, op.

cit., 1907, p. 160.

FAMILY ZOSTEROPIDÆ.

276. **Zosterops simplex** Swinh. **Hime-mejiro*.

Swinhoe, P. Z. S., 1871, p. 349; La Touche, Ibis, 1895, p. 314;

La Touche, op. cit., 1898, p. 367; Tada, Taiwan Chōrui Ippan, p. 28;

Grant and La Touche, Ibis, 1907, p. 167; Grant, op. cit., 1908,

p. 602.

Specimens from :

Kagi (Kagi Distr.), Sept. 27.

Sanshiten (Kagi Distr.), Sept. 13.

Taihoku (Taihoku Distr.), Aug.

Shisangan (Taihoku Distr.), Sept. 3.

Rantaisan (Nantō Distr.), Mar. 16.

Family DICÆIDÆ.

- *277. **Dicæum** sp. **Hanadori*.

Apparently nearest to *D. erythrorhynchus* (Lath.) but differing from it in having no dusky center to head feathers.

Two specimens, both female, from :

Uraitaura, Jan. 12.

Chūho (Banshoryō Distr.), Aug. 10.

Family FRINGILLIDÆ.

- *278. **Eophona personata** (Temm. & Schl.) *Ikaru*.

Obtained in Horisha (Nantō Distr.), Jan.

279. **Eophona migratoria** Hart. *Rikuzen-ikaru*.

Grant and La Touche, Ibis, 1907, p. 163; *Eophona melanura migratoria* Hartert, Vögel Pal. Faun. pt. i, p. 59; *Coccothraustes melanurus* (Gmel.), La Touche, Ibis, 1898, p. 368; *Coccothraustes melanura* Jard. & Selbg., Tada, Taiwan Chōrui Ippan, p. 51.

Obtained in Tansui (Taihoku Distr.), April 16.

- *280 **Coccothraustes vulgaris japonicus** (Temm. & Schl.).

Shime.

281. **Carpodacus incertus** Grant. **Takasago-mashiko*.

Grant, Bul. B. Br. O. C. XVI, p. 122; Grant and La Touche, Ibis, 1907, p. 164; Rothschild, Bull. B. O. C., XXI, p. 9; Grant, Ibis, 1908, p. 601.

Specimens from :

Arisan (Kagi Distr.), April 12.

Niitakayama (Mt. Morrison), Jan.

282. **Chrolis sinica** (L.) *Kawara-hiwa*.

Sharpe, Cat. B. Br. Mus, xii, p. 26; Grant and La Touche, Ibis, 1907, p. 163.

283. **Phyrrhula owstoni** Roths. & Hart. **Takasago-uso*.

Rothschild, Bul. B. O. C. XXI, p. 9; Grant, Ibis, 1908, p. 602; Uchida, Dōbutsugaku Zasshi, 1910, p. 530.

Obtained in Shishaban (Banshoryō Distr.), July 16.

284. **Passer montanus** (L.). *Suzume*.

Swinhoe, P. Z. S., 1871, p. 386; La Touche, Ibis, 1895, p. 335;
La Touche, op. cit., 1898, p. 368; Tada, Taiwan Chōrui Ippan, p.
49; Grant and La Touche, Ibis, 1907, p. 163.

Specimens from :

Gyochi (Nantō Distr.), Feb. 2.

Suisha (Nantō Distr.), Sept. 3.

Kagi (Kagi Distr.), Nov. 13.

Bōkotō (Pescadores IIs.), Jan.

285. **Passer rutilans** Temm. *Niunai-suzume*.

Swinhoe, P. Z. S., 1871, p. 386; Sharpe, Cat. B. Br. Mus., xii,
p. 329; Tada, Taiwan Chōrui Ippan, p. 51; Grant and La Touche,
Ibis, 1907, p. 163.

Specimens from :

Horisha (Nantō Distr.), Jan.

Shamikisha, April 5.

Family EMBERIZIDÆ.

286. **Emberiza fucata** Pall. *Hōaka*.

Grant and La Touche, Ibis, 1907, p. 164.

287. **Emberiza cioides** Brandt. *Hōjiro*.

Grant and La Touche, Ibis, 1907, p. 165.

288. **Emberiza spodocephala** Pall. *Kara-aoji*.

Swinhoe, P. Z. S., 1871, p. 388; La Touche, Ibis, 1895, p. 335;
La Touche, op. cit., 1898, p. 368; Tada Taiwan Chōrui Ippan, p. 49;
Grant and La Touche, Ibis, 1907, p. 164.

Specimens from :

Gyochi (Nantō Distr.), Dec. 16.

Manka (Taihoku Distr.), April 27.

Nankō (Kōshun Distr.).

289. **Emberiza aureola** Pall. *Shima-aoji*.

Grant and La Touche, Ibis, 1907, p. 164.

290. **Emberiza sulphurata** (Temm. & Schl.).. .. *Nojiko*.

Sharpe, Cat. B. Br. Mus., xii, p. 519; Tada, Taiwan Chōrui Ippan, p. 51; Grant and La Touche, Ibis, 1907, p. 164; *Eupiza sulphulata* (Temm. & Schl.), Swinhoe, P. Z. S., 1871, p. 388.

TABLE SHOWING DISTRIBUTION OF FORMOSAN BIRDS
IN NEIGHBORING REGIONS.

Species	Liukiu Is.	S. E. China	Hainan	Philip- pine Is.
<i>Colymbus septentrionalis</i>		×		
<i>Podiceps philippensis</i>		×	×	×
<i>Diomedea albatrus</i>		×		
<i>Diomedea nigripes</i>	×			
<i>Oceanodroma monorhis</i>				
<i>Bulweria bulweri</i>				
<i>Puffinus leucomelas</i>				×
<i>Puffinus cuneatus</i>	×			
<i>Sula sula</i>	×			×
<i>Phalacrocorax carbo</i>		×	×	×
<i>Phalacrocorax bicristatus</i>				
<i>Fregata minor</i>				
<i>Ardea cinerea</i>	×	×	×	×
<i>Ardea coromanda</i>	×	×	×	×
<i>Herodias eulophotes</i>	×	×		
<i>Ardea garzetta</i>		×	×	×
<i>Ardea intermedia</i>		×		×
<i>Ardetta sinensis</i>	×	×	×	×
<i>Botaurus stellaris</i>				×
<i>Gorsachius goisagi</i>				×
<i>Gorsachius melanolophus</i>			×	×
<i>Phonyx manillensis</i>	×	×		×
<i>Herodias alba</i>	×	×	×	×
<i>Ardetta cinnamomea</i>	×	×	×	×
<i>Nycticorax nycticorax</i>		×	×	×
<i>Butorides javanica</i>		×	×	×
<i>Nycticorax prasinoseles</i>		×	×	
<i>Dupetor flavicollis</i>			×	×
<i>Ibis nippon</i>				
<i>Platalea minor</i>		×	×	
<i>Platalea major</i>				
<i>Anas javanica</i>	×	×	×	

<i>Anas zonorhyncha</i>	×	×		×
<i>Anas boschas</i>	×	×		
<i>Anas formosa</i>		×		
<i>Anas falcata</i>		×		
<i>Æx galericulata</i>	×	×		
<i>Aethya fuligula</i>	×	×		×
<i>Aethya marila</i>	×	×		
<i>Clangula clangula</i>		×		
<i>Dafila acuta</i>		×		×
<i>Oidemia fusca stejnegeri</i>				
<i>Spatula clypeata</i>	×	×		×
<i>Tadorna cornuta</i>	×	×		
<i>Tadorna rutila</i>		×		
<i>Mareca penelope</i>		×	×	×
<i>Nettion crecca</i>	×	×	×	×
<i>Querquedula circia</i>		×	×	×
<i>Mergus serrator</i>	×	×		
<i>Anser albifrons</i>		×		
<i>Circus æruginosus</i>		×	×	×
<i>Circus spilonotus</i>		×	×	×
<i>Accipiter gularis</i>		×		×
<i>Accipiter affinis</i>		×	×	
<i>Lophospiza trivirgata</i>				×
<i>Aquila heliaca</i>		×		
<i>Spilornis cheela</i>		×	×	
<i>Spizæus nipalensis</i>			×	
<i>Buteo vulgaris</i>		×	×	
<i>Buteo indicus</i>	×	×		×
<i>Milvus ater melanotis</i>	×	×	×	
<i>Falco tinnunculus japonicus</i>	×	×	×	×
<i>Falco peregrinus</i>	×	×	×	×
<i>Pandion haliaetus</i>		×	×	×
<i>Turnix taigoo</i>	×	×		
<i>Turnix dussumieri</i>			×	
<i>Arboricola crudigularis</i>				
<i>Coturnix coturnix</i>		×		
<i>Excalfactoria chinensis</i>		×	×	
<i>Bambusicola sonorivox</i>				

Gennæus swinhoii				
Phasianus formosanus				
Calophasis mikado				
Hypotaenidia striata				×
Rallina formosana				
Porzana fusca		×		×
Amaurornis phœnicura			×	×
Gallicrex cinerea	×	×	×	×
Gallinula chloropus	×	×	×	×
Fulica atra	×	×	×	×
Streptilas interpres		×	×	×
Squatarola helvetica	×	×	×	×
Charadrius fulvus	×	×	×	×
Charadrius minor	×	×	×	×
Charadrius mongolicus		×	×	×
Charadrius geoffroyi		×	×	×
Charadrius cantianus		×	×	
Lobivanellus cinereus				
Vanellus vulgaris		×		
Hæmatopus osculans		×		
Himantopus himantopus		×		×
Recurvirostra avocetta		×		
Numenius arquatus	×	×	×	×
Numenius variegatus		×	×	×
Numenius minutus		×		×
Numenius cyanopus		×		×
Limosa rufa uropygialis		×	×	×
Totanus terekus		×	×	×
Totanus incanus brevipes		×		×
Totanus glareola		×	×	×
Totanus hypoleucus	×	×	×	×
Totanus ochropus		×	×	×
Totanus stagnatilis			×	
Totanus grottis		×	×	×
Totanus calidris		×	×	
Phalaropus hyperboreus	×	×	×	
Limicola sibirica			×	×
Tringa ruficollis		×	×	×

<i>Tringa acuminata</i>		x		x
<i>Tringa alpina pacifica</i>			x	
<i>Tringa arenaria</i>		x	x	
<i>Tringa temmincki</i>		x	x	x
<i>Tringa subarquata</i>		x	x	x
<i>Rostratula capensis</i>		x	x	x
<i>Gallinago caelestris</i>	x	x	x	x
<i>Gallinago megala</i>	x	x		x
<i>Gallinago gallinula</i>		x		
<i>Gallinago stenura</i>		x	x	x
<i>Scolopax rusticola</i>	x	x	x	
<i>Glareola orientalis</i>		x	x	x
<i>Hydrophasianus chirurgus</i>		x	x	x
<i>Larus ridibundus</i>		x	x	x
<i>Larus saundersi</i>		x	x	
<i>Larus canus</i>		x	x	
<i>Larus crassirostris</i>		x		
<i>Larus vegæ</i>	x	x		x
<i>Sterna sinensis</i>	x	x	x	x
<i>Sterna stolidus</i>	x	x		x
<i>Sterna anæstheta</i>			x	x
<i>Sterna fuliginosa</i>	x			x
<i>Sterna bergii</i>	x	x		
<i>Hydrochelidon hybrida</i>		x		x
<i>Hydroprogne caspia</i>		x	x	
<i>Turtur orientalis</i>	x	x	x	
<i>Turtur humilis</i>		x	x	x
<i>Turtur chinensis</i>		x	x	
<i>Chalcophaps indica</i>	x	x	x	x
<i>Columba pulchricollis</i>				
? <i>Columba intermedia</i>	x			
<i>Macropygia phæa</i>				x
<i>Sphenocercus sororius</i>			x	
<i>Sphenocercus formosæ</i>				x
<i>Cuculus canolus</i>	x	x		x
<i>Cuculus poliocephalus</i>				
<i>Cuculus saturatus</i>	x	x		x
<i>Centrops javanicus</i>		x	x	x

<i>Halcyon coromanda</i>	×	×		×
<i>Alcedo bengalensis</i>	×	×	×	×
<i>Strix candida</i>				×
<i>Syrnium nivicola</i>				
<i>Syrnium indranee</i>		×	×	
<i>Glaucidium pardalotum</i>			×	
<i>Ninox japonica</i>	×	×	×	×
<i>Scops hambroeki</i>				
<i>Scops elegans</i>		×		
<i>Scops japonicus</i>				
<i>Caprimulgus monticola</i>		×		
<i>Chætura nudipes</i>				
<i>Cypselus pacificus</i>		×	×	
<i>Cypselus subfurcatus</i>		×	×	
<i>Cyanops nuchalis</i>				
<i>Iyngipicus kalensis</i>				
<i>Iyngipicus wattersi</i>				
<i>Gecinus tancolo</i>				
<i>Dedrocopus insularis</i>		×		
<i>Pitta nympha</i>				
<i>Alauda sala</i>				×
<i>Alauda œlivox</i>		×	×	
<i>Motacilla taivana</i>	×	×	×	×
<i>Motacilla melanope</i>	×	×	×	×
<i>Motacilla leucopsis</i>		×	×	
<i>Motacilla ocularis</i>		×	×	×
<i>Motacilla lugens</i>	×	×		
<i>Anthus maculatus</i>	×	×	×	×
<i>Anthus cervinus</i>	×	×	×	×
<i>Anthus richardi</i>		×	×	×
<i>Trochalopterum taivanum</i>				
<i>Trochalopterum morrisonianum</i>				
<i>Pomatorhinus musicus</i>				
<i>Pomatorhinus erythrocnemis</i>				
<i>Garrulax rificeps</i>				
<i>Dryonastes pœcilorhynchus</i>				
<i>Alcippe morrisonia</i>		×	×	
<i>Proparus formosanus</i>				

<i>Schœniparus brunneus</i>		×	×	
<i>Stachyrhiodopsis præcognitus</i>		×	×	
<i>Myiophoneus insularis</i>				
<i>Malacias auricularis</i>				
<i>Actinodura morrisoniana</i>				
<i>Yuhina brunneiceps</i>				
<i>Herpornis tyrannulus</i>		×	×	
<i>Liocichla steeri</i>				
<i>Suthora bulomachus</i>		×		
<i>Suthora morrisoniana</i>				
<i>Picnonotus taivanus</i>				
<i>Picnonotus sinensis formosæ</i>		×	×	
<i>Hypsipetes nigerrimus</i>			×	
<i>Hypsipetes amaurotis squamiceps</i>				
<i>Spizixus cinereicapillus</i>				
<i>Hemichelidon sibirica</i>		×	×	×
<i>Hemichelidon ferruginea</i>		×	×	×
<i>Alseonax latirostris</i>		×	×	×
<i>Muscicapa luteola</i>		×	×	
<i>Muscicapa griseisticta</i>		×		×
<i>Niltava cyanomelæna</i>		×	×	×
<i>Cyornis vivida</i>				
<i>Muscicapa hypertythra</i>				
<i>Xanthopygia affinis</i>		×		
<i>Hypothymis azurea</i>		×	×	×
<i>Terpsiphone princeps</i>	×	×	×	
<i>Terpsiphone nigra</i>				×
<i>Cryptolopha fulvifacies</i>				
<i>Turdus fuscatus</i>	×			
<i>Turdus naumanni</i>	×	×		
<i>Turdus chrysolaus</i>	×	×	×	×
<i>Turdus obscurus</i>	×	×		×
<i>Turdus pallidus</i>	×	×		×
<i>Turdus albiceps</i>				
<i>Geocichla varia</i>	×	×		×
<i>Monticola solitarius</i>	×	×	×	×
<i>Ruticilla aureora</i>		×	×	
<i>Pratincola maura</i>	×	×		

<i>Calliope comtschatkensis</i>	×	×	×	×
<i>Ianthia cyanura</i>		×	×	
<i>Ianthia johnstoniæ</i>				
<i>Notodela montium</i>				
<i>Microcichla scouleri</i>		×		
<i>Acrocephalus orientalis</i>	×	×		×
<i>Cisticola volitans</i>				×
<i>Cisticola cisticola</i>	×	×	×	×
<i>Lusciniola fuscata</i>		×	×	
<i>Urosphena squamiceps</i>			×	
<i>Horornis robustipes</i>		×		
<i>Horornis canturians</i>		×	×	×
<i>Phylloscopus superciliosus</i>		×	×	
<i>Phylloscopus xanthodryas</i>				×
<i>Phylloscopus borealis</i>		×		×
<i>Phylloscopus coronatus</i>		×		
<i>Regulus cristatus orientalis</i>				
<i>Regulus goodfellowi</i>				
<i>Suya crinigera</i>		×		
<i>Prinia extensicauda</i>			×	
<i>Burnesia sonitans</i>		×	×	
<i>Cinclus marila</i>		×		
<i>Anorthura fumigata</i>				
<i>Hirundo striolata</i>				×
<i>Hirundo gutturalis</i>	×	×	×	×
<i>Cotile riparia</i>		×		×
<i>Pericrocotus cinereus</i>		×		×
<i>Pericrocotus griseigularis</i>		×	×	
<i>Graucalus rex-pineti</i>		×	×	
<i>Chaptia brauniana</i>				
<i>Buchanga atra</i>		×	×	
<i>Ampelis japonicus</i>	×			
<i>Lanius schach</i>		×	×	
<i>Lanius lucionensis</i>	×	×		×
<i>Sitta sinensis</i>		×		
<i>Machlolophus holsti</i>				
<i>Parus insperatus</i>				
<i>Parus castaneiventris</i>				

<i>Ægithalos concinnus</i>		×		
<i>Oriolus indicus</i>		×	×	×
<i>Oriolus ardens</i>			×	
<i>Uroloncha acuticauda</i>		×	×	
<i>Munia topela</i>		×	×	
<i>Munia formosana</i>				×
<i>Corvus macrorhynchus levaillanti</i>	×	×	×	
<i>Pica pica</i>		×	×	
<i>Urocissa caerulea</i>				
<i>Dendrocitta formosæ</i>			×	
<i>Garrulus taivanus</i>				
<i>Acridotheres cristatellus</i>		×	×	
<i>Spodiopsar cineraceus</i>	×	×	×	
<i>Sturnia sinensis</i>		×	×	×
<i>Zosterops simplex</i>		×	×	
<i>Dicaeum</i> sp.				
<i>Eophona personata</i>		×		
<i>Eophona migratoria</i> ..		×		
<i>Coccothraustes vulgaris japonicus</i>				
<i>Carpodacus incertus</i>				
<i>Chloris sinica</i>		×		
<i>Pyrrhula owstoni</i>				
<i>Passer montanus</i>	×	×	×	×
<i>Passer rutilans</i>		×		
<i>Emberiza fucata</i>	×	×	×	
<i>Emberiza cioides</i>	×	×		
<i>Emberiza spodocephala</i>	×	×	×	×
<i>Emberiza aureola</i>		×	×	
<i>Emberiza sulphurata</i>		×		×

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Notes on the Spermatogenesis of the Wild and the Domesticated Silkworms.

By

Naohide Yatsu.

Although the spermatogenesis of some lepidoptera has been lately studied with especial reference to the chromosomes by the late Miss STEVENS ('05), MUNSON ('06), Miss DEDERER ('07) and Miss COOK ('10), yet that of the silkworm has not been undertaken since the appearance of TOYAMA'S papers ('94 a and b). What one finds in the later literature regarding the germ-cells of the silkworm is limited to fragmentary notes by LA VALETTE ST. GEORGE ('97), HENNEGUY ('98) and MEVES ('03) on structures other than the chromosomes. Such paucity of works on the spermatogenesis of the silkworm is rather remarkable, since in most countries the material can be obtained without difficulty.

As there are quite a number of varieties in the domesticated silkworm, I thought that they would be an excellent object for the study of correlation between their morphological features and the chromosomal characters. So I undertook a comparative study of spermatogenesis of the wild silkworm (*Theophila mandriana*) and of the following seventeen varieties of the domesticated silkworm (*Bombyx mori*):

- | | | |
|------------------------------|---|-----------------|
| 1. Dainyorai | } | Japanese races. |
| 2. Aojiku | | |
| 3. Koishimaru | | |
| 4. Araya | | |
| 5. Watako | | |
| 6. Seihaku | | |
| 7. Shirojima × Kurojima | } | Corean races. |
| 8. Kasasagi | | |
| 9. Corean No. 1 (dark brown) | | |
| 10. Corean No. 1 (green) | | |

11. Shin-en	}	Chinese races.
12. Ryūkaku		
13. Birōdo		
14. Chinese		
15. Bagdad	}	Turkish races.
16. Bas-Alps		
17. Italian No 1	}	European races.

As fixing fluids acetic-sublimate and FLEMMING'S solution were used. The latter preserves excellently both the cilia and the V-shaped centrioles of the primary spermatocyte, which were described and figured by MEVES ('97) and HENNEGUY ('98).

It is interesting to note that the testes of all the yellow cocoon races are yellow as are also their silk-glands and body-fluid. In those races, moreover, the testes grow slower than in the white cocoon races, so that the larvae of the former yield testes of suitable stages for the study, when they have grown to a size much larger than those of the latter.

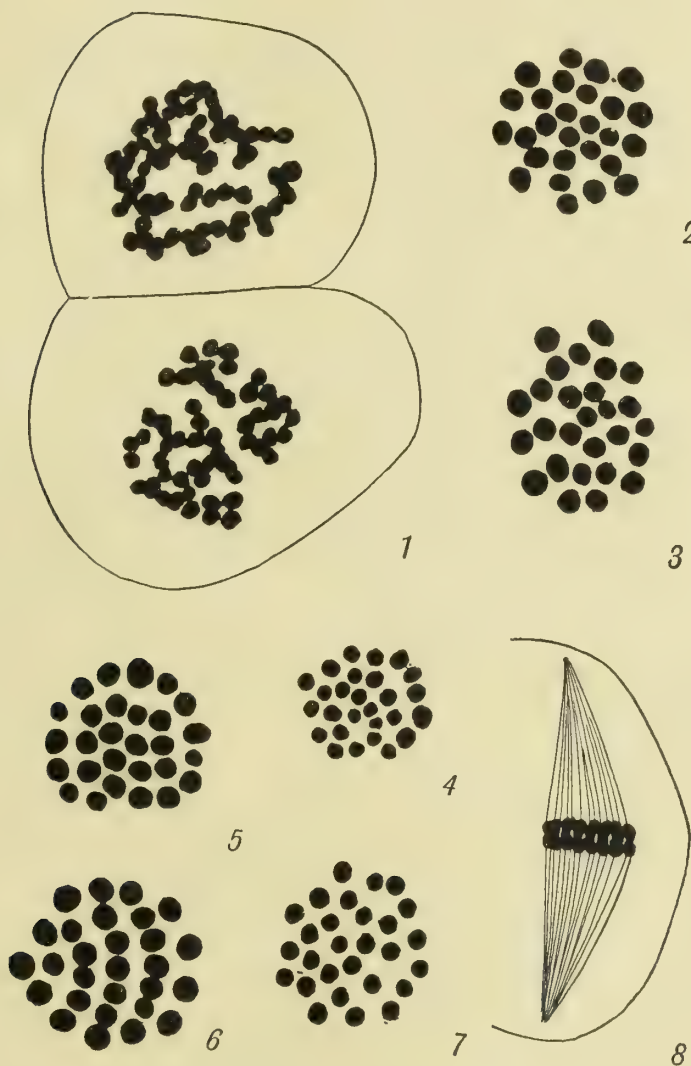
I experienced some difficulty in getting the material of the wild silkworm. A large percentage of its larvae was found to be infested by the maggot (*Ugimia sericaria*), and only a few individuals could be obtained, that were free from the parasites and yielded good testes for my purpose.

Besides the testes, young ovaries were cut into sections in order to study the oögonial division.

Here I must thank Professor TOYAMA of the Agricultural College and Mr. HAYASHI of the Tokyo Sericultural Institute for the kindness shown me in many ways, especially in providing me with the material.

Results.

As will be seen from the appended figures, all the chromosomes of the silkworms look almost alike, there being found no perceptible differences both in shape and size. A constant mode of arrangement of the chromosomes at the metaphase cannot be detected. Of the seventeen varieties, that came under my examination, I could find no



All the figures were drawn with the camera at the level of table and with Zeiss apochromat 1.5mm. oil immersion objective and No. 18 compensating eye-piece, which combination gives an enlargement of 4800 diameters.—Fig. 1, metaphase of spermatogonial division in the domesticated silkworm ("Shirojima" × "Kurojima"); polar view.—Figs. 2 and 3, equatorial plates of first spermatocyte-division in the wild silkworm (27 chromosomes).—Fig. 4, second spermatocyte-division in same (27 chromosomes).—Fig. 5, first division in the domesticated silkworm, race "Italian No. 1" (28 chromosomes).—Fig. 6, same, race "Kasasagi."—Fig. 7, second division in same, race "Birōdo."—Fig. 8, same, race "Kasasagi"; side view.

difference in their chromosomal characters. This seems rather remarkable in view of the fact that the larvae are so divergent in external characters. It may, therefore, be concluded that among varieties of the silkworm there is no morphological correlation between external features and chromosomes. Thus the primary object of the present study was frustrated. Nevertheless, I may mention the two following facts as worth noting.

1. The haploid number of chromosomes in the domesticated silkworm is 28, contrary to TOYAMA'S statement. This was determined by counting the chromosomes at the metaphase of the first and the second spermatocyte division (figs. 5, 6 and 7). The unreduced number, therefore, must be 56. During spermatogonial divisions the chromosomes cannot be exactly counted owing to their crowded state, but they number unquestionably between 50 and 60, and decidedly not 28 as TOYAMA has stated ('94b, p. 132). There occurs apparently the same number of chromosomes in the equatorial plate during the division of oogonia and of the follicle cells of both the testis and ovary. It need hardly be mentioned that the second spermatocyte division is of the ordinary type, contrary to TOYAMA'S observation ('94b p. 137). That author thought that each of the 28 bivalent chromosomes does not divide, but half of them go to one pole and the remaining to the other, thus reducing the number to 14. It is a rather singular coincidence that MUNSON ('06) also observed a similar mode of division in *Papilio rutulus*. As a matter of fact, each of the chromosomes becomes constricted into two, as is seen in the side-view shown in fig. 8, each spermatid receiving 28 chromosomes. I have no evidence to decide which of the two spermatocyte divisions is reducing.

2. In the wild silkworm known to systematists as *Theophila anandriana* or *Bombyx mandriana*, the haploid number of chromosomes is 27 (figs. 2, 3 and 4). The unreduced number should then be 54, though for the same reason as mentioned above, the exact number of the chromosomes in the diploid group cannot be made out.

By comparing various characteristics of the wild and domesticated silkworms, SASAKI ('98, came to the conclusion that the former should be taken for the ancestral form, from which the various races of the ordinary silkworm were derived. If so, in the course of domestication the wild form must have acquired two additional chromosomes. But when and how these two came into existence is still an open question. Not unlikely ancient people took hold of a mutant from the wild *Theophila* and succeeded in producing from it the races better fitted for their need.

It will be of great interest to study the chromosome groups in the cross of the wild and domesticated silkworms. Male *Theophila* is known to come sometimes from the mulberry bush to mate with female *Bombyx* moth and, as I was told, the rearing of the cross is not a difficult task. It is highly probable that in the germ cells of the cross, one chromosome of the domesticated silkworm will not find its mate at synapsis and will appear as an accessory or heterotropic chromosome.

Zoological Institute, Tokyo Imp. Univ.

Nov. 1, 1912.

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On a New Stalked Crinoid from the Sagami Sea (*Phrynocrinus obtortus*).

By

H. Matsumoto, *Rigakushi*.

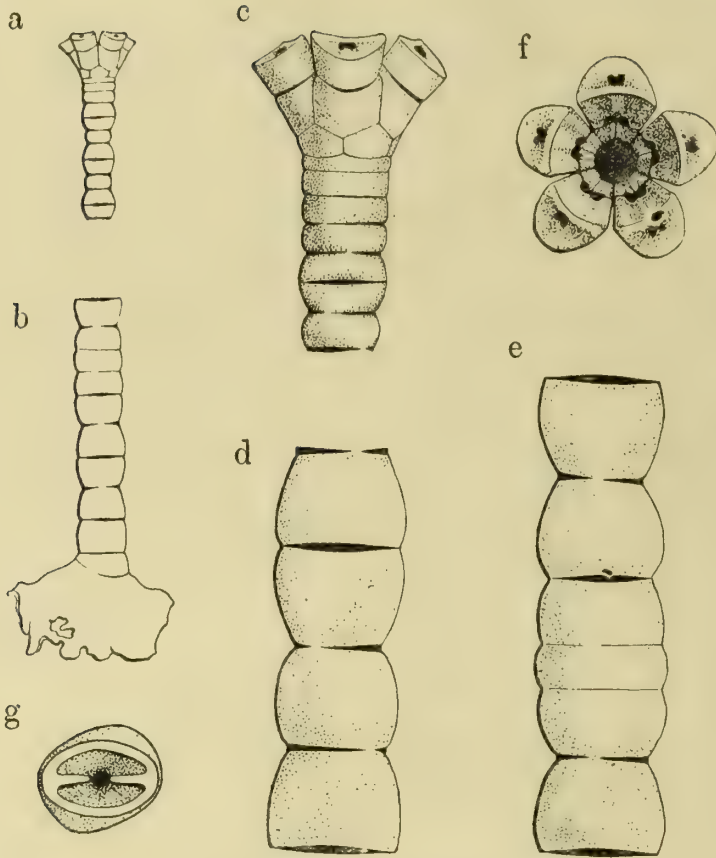
Zool. Inst. Sci. Coll., Tokyo.

The collector of the Misaki Marine Laboratory, Mr. K. Aoki, obtained a specimen of an interesting stalked Crinoid at Okinose in the Sagami Sea on Jan. 14., 1912. Though unfortunately the greater part of its crown had been broken off and lost, the curious structure of the stem at once attracted my attention, and on a close examination it was found that this crinoid is evidently referable to *Phrynocrinus** CLARK, but that it represents a second and new species distinct from the genotype.

Phrynocrinus obtortus, n. sp.

The stem, completely preserved, measures 320 mm. in length and is composed of columnals just one hundred in number. These in lateral view presents each a somewhat trapezoidal outline with convexly swollen lateral sides. The external surface of each columnal is divided into four triangular areas by rounded edge-like boundaries, and with the apices directed alternately upwards and downwards. Taking any two consecutive columnals, the upwardly directed apices of the triangular areas of the lower one are apposed to the downwardly directed apices of same of the upper. The articular surfaces are elliptical in outline (fig. g), the long (fulcral) axes of the upper and lower articular surfaces not coinciding in their direction but running so as to form certain angles

* Literature: CLARK 1907, two new Crinoids from the North Pacific Ocean. Proc. U. S. Nat. Mus., Vol. XXXII, No. 1543.—Ditto 1910, the phylogenetic interrelationships of the recent Crinoids. Ibid., Vol. XXXVIII, No. 1732.—Ditto 1910, on the origin of certain types of Crinoid stems. Ibid., Vol. XXXVIII, No. 1749.

*Phrynocrinus obtortus.*

a. Calyx and upper parts of stem. $\times 1$. b. Root and lower end of stem $\times 1$. c. Calyx and upper end of stem. $\times 3$. d. Middle parts of stem. $\times 3$. e. Twelfth to seventh columnals from root. $\times 3$. f. Calyx viewed from above. $\times 3$. g. A columnal showing the upper articular surface. $\times 3$.

between them. The surfaces are more narrowly elliptical in the upper parts of the stem than in the lower parts, towards which they become gradually broader until they finally assume a nearly circular outline. The lowest columnal is but indistinctly set off from the encrusting root, being in firm fusion with the latter (fig. b). Columnals in the lower parts of the stem measure 6 mm. in length of the long (fulcral) axis and 5 mm. in that of the short, by an average vertical length of 4 mm ; in

all of them the long axes of the upper and lower articular surfaces run in directions at right angles with each other. The seventh to ninth columnals, counted from the root, are almost soldered into one piece, showing between them very imperfect and scarcely movable articulations (fig. b); they measure altogether 9 mm. in length. The thirteenth to fifteenth columnals, likewise counted from the lower stem end, are also partially fused together, the articulations between them being still more imperfect than in the last mentioned section and being but feebly indicated by two constriction lines (fig. e). The three together are 8 mm. long; the middle one is much shorter than the others, measuring only 1.5 mm. in length. From about the end of the lowest third of the stem upwards, the columnals measure 6 mm. in major and 4 mm. in minor diameter, and 4.5 mm. in vertical length, the long axes of the upper and lower articular surfaces being always so directed as to intersect each other at angles of about $\frac{2\pi}{5}$. Finally in the uppermost parts of the stem, the columnals measure 4.5 mm. in major diameter, 3 mm. in the minor, and 2 mm. in vertical length, the long axes of their upper and lower articular surfaces crossing each other at angles of about $\frac{2\pi}{6}$. Thus, the stem as a whole is sinistrously twisted in the upper two thirds of its length. The third columnal from the top is 1.5 mm, the second 1 mm., and the topmost or the *proximale* 0.5 mm. in length. The third and the second are nearly, while the second and the *proximale* are quite firmly soldered together. All these three uppermost columnals are shaped nearly like circular discs, measuring 4 mm. in diameter.

The basals are pentagonal, measuring 3 mm. in width and 1.5 mm. in height; the lateral sides are 0.5 mm. long; the lower side is 2.5 mm. long and gently curved. The first radials are likewise pentagonal, 3 mm. wide, 2 mm. long in the median line, and 2.5 mm. along lateral sides; the external surface is convex, especially so in its upper part, so that the upper articular surface is practically semicircular in outline. The *proximale*, basals and first radials are completely soldered toge-

ther. The circlet of first radials is 6. mm. in diameter at the upper border. The second radials have strongly convex external surfaces, and present nearly semicircular articular surfaces both above and below; each second radial is 1.7 mm. high, 3 mm. wide, and 1.7 thick. They articulate with the first radials, but do not stand in contact with one another. The remaining parts of the animal are wanting in the unique specimen before me.

The colour of the dry specimen is a dull yellowish brown.

Locality: Okinosé, off Misaki in the Sagami Sea; depth about 330 fathoms.

The present species differs from the genotype, *Ph. nudus* CLARK, chiefly in the more convex external surface of the columnals, in the long axes of the upper and lower articular surfaces being disposed not always at right angles as the result of the twisting of the stem, and in the basals being pentagonal, instead of triangular, in shape.

Preliminary Notice of a New Interesting Ophiuran (*Astrophiiura kawamurai*).

By

H. Matsumoto, *Rigakushi*.

Zool. Inst., Sci. Coll., Tokyo.

(*With Plate III.*)

Together with the curious Crinoid which I have described in another paper published in this journal under the name of *Phrynocrinus obtortus*, an interesting specimen of apparently a new species of *Astrophiiura* was sent me by Mr. K. Aoki of the Misaki Marine Laboratory. The two were said to have been obtained at the same locality and on the same day. The specimen in question I have called *A. kawamurai*. Deferring its full description to a future paper, I propose to give here a preliminary notice of it.

Astrophiiura kawamurai, n. sp.

Diameter of the pentagonal body 12 mm; that of the disk proper, or of the circle passing through the outer ends of radial shields, 7 mm. Length of the free arms, 6 mm. Width of same close to the pentagonal body, 0.4 mm.

In all essential features this species is like the genotype (*A. permira*). On the dorsal side, the pentagonal "asteroid" body is entirely covered over by stout primary plates and radial shields of the disk proper and by the dorsal and lateral arm-plates of modified arm bases. The primary plates consist of the single central, five basals, five radials, five first interradians and five second interradians. The infrabasals, basals and interradians are elevated above the level of the central, radials and radial shields, so as to form a regular symmetrical system of ridges. Dorsal arm-plates number 7 or 8 in

each radius; they are confined in occurrence to the pentagonal body. Each dorsal plate with a pair of lateral arm-plates which are greatly modified, in relation to their being contained within the pentagonal body. The two first lateral arm-plates belonging to different but directly adjoining radii are apposed to each other in their distal parts and outside of the second interradii. Distal edges of successive lateral plates form a continuous line forming interradii border of the pentagonal body. This border is slightly concave in the middle and is margined by a series of soldered papillæ, which are evidently modified arm-spines of the modified lateral plates. These papillæ grow longer towards the middle of interradii border, there attaining a length about equal to the width of the lateral plate they belong to. They number 3 or 4 to each lateral plate.

The ventral interbrachial surface of the pentagonal body, with the exception of the peripheral zone, is covered with a thin skin containing fine, delicate, transparent, close-set and polygonal or circular scales. The peritoneal cavity and genital glands can be discerned through the skin; both apparently extend into the arm bases. Genital bursæ, plates and scales are absent, while the genital openings are invisible. There is only a single oral shield, the madreporite, which is irregularly triangular in shape and so small and transparent as to be scarcely perceivable unless the specimen be dried. It is separated from the adoral shields by a space. The adoral shields (erroneously called "genital plates" by SLADEN) are long and narrow, with free inner ends. The oral plates (again erroneously called "side mouth shields," i. e. adoral shields, by SLADEN) are large and stout. A single tooth ("apical mouth papillæ" of SLADEN) is present at the apex of each jaw, directed somewhat upwards. There occur no dental or genuine oral papillæ; but there exist six or seven papillæ ("mouth papillæ," i. e. oral papillæ, of SLADEN) to each jaw; they are deeply situated within the oral slits, are directed upwards, and lie on the whole on a higher level than the single tooth, though the most apical two or three of

them are distinctly above it. They are possibly nothing else than scales of the first oral tentacles.

Ventral arm-plates in each interradius number 8 or 9, all situated within the limit of the pentagonal body. 7 or 8 pairs of tentacles are present in each radius, being also confined in their occurrence to the pentagonal body. The first pair of them are very large, and are homologous with the second oral tentacles of other Ophiurans, belonging, as they do, to the same arm-joint together with the first ventral arm-plates and adoral shields. All the tentacle pores, except the outermost one or two, are provided with one or two scales. Every two successive tentacle pores are separated from each other by a ridge (erroneously considered by SLADEN to be "ambulacural plate") of the basal or adradial parts of the lateral arm plate, which belongs to the same joint as the outer of the two pores.

The free distal parts of arms outside the pentagonal body are very abortive, being devoid of any dorsal and ventral arm-plates as well as of tentacle pores. There is a single, very small arm spine on each lateral arm-plate, though on the first one or two free joints, there occur two or three spines. In some radii, indications are not wanting of the first free arm-joint being in the process of being taken up into the pentagonal body.

Colour in alcohol : whitish, or light yellow ; central, radials, radial shields and the inner parts of ventral interbrachial spaces bluish gray.

Locality : Okinosé, a submarine bank off Misaki in the Sagami Sea. Depth about 330 fathoms.

The present species differs from the genotype, *A. permira* SLADEN, chiefly in the very regular arrangement of plates on the dorsal surface of the pentagonal body ; in the larger central plate ; in the much smaller and quite regular infrabasals ; in the much narrower basals and interradians being raised so as to form a regular symmetrical system of ridges ; in the radial shields forming a pair being scarcely in direct contact with each other instead of overlapping ; in

the absence of a central boss on the primary plates; in the very regular-shaped and much narrower dorsal arm-plates; in the much smaller and rather inconspicuous madreporic shield; in the longer adoral shields; in the somewhat narrower oral plates, the two in inter-radial pairs being in contact with each other to a less extent; in the saddle-shaped ventral arm-plates; and finally in the free arms being much narrower. Again, this species differs from CHUN's *Astrophiura*,* which has not yet been specifically named, chiefly in the smaller and regular-shaped infrabasals; in the narrower basals and interradians; in the elevated infrabasals, basals and interradians; in the absence of a central boss on the primary plates; in the much narrower dorsal arm-plates; and in the much narrower free arms. The *Astrophiura* sp. just referred to seems to stand somewhat nearer to the genotype than to the present species.

*CHUN, Aus den Tiefen des Weltmeeres, 1900, p. 488, fig. Ditto, 2te Aufl., 1903, p. 171, fig.

Explanation of Plate III.

Fig. 1. *Astrophiura kawamurai* viewed from above. $\times 6$.

Fig. 2. Ditto viewed from below. $\times 6$.

A Revision of the Mantispidae of Japan.

By

Waro Nakahara.

In spite of the fact that the Mantispidae of Japan have been studied by MacLachlan¹⁾, Miyake²⁾, Okamoto³⁾ and others⁴⁾, I have had the good fortune of discovering a new species from the Province of Harima. This I propose to describe in this paper, at the same time improving the opportunity by adding some remarks on all other species of the family found in Japan.

The wing venation has been regarded by many entomologists as one of the most important characters for the systematic of the Mantispidae. This is no doubt true to a degree, but for the purpose of specific distinction I have found it to be much too variable a character to rely upon.

Family MANTISPIDÆ.

Subfamily **Mantispinæ**.⁵⁾

Genus **Eumantispa** Okamoto.

Okamoto, Zool. Anz., xxxvii, p. 299 (1911).

So far as known, this genus seems to be peculiar to Japan.

1) A sketch of our present knowledge of the neuropterous fauna of Japan (excluding Odonata and Trichoptera). Trans. Ent. Soc. Lond., 1875, Pt. ii.

2) The Mantispidae of Japan. Journ. Coll. Agricul. Imp. Univ. Tokyo, Vol. ii, 1910.

3) Beiträg zur Mantispiden Fauna Japans. Zool. Anz. Bd. xxxvii, 1911.

4) Matsumura, Syst. Ent. (Konchū-bunruigaku), Vol. i, 1937.—Navas, Mantispidos nuevos, Mem. Real. Acad. Cien. Art. Bar., Vol. vii, 1909.

5) The other subfamily, Anisopterinae, is, so far as known, not represented in Japan.

1. *Eumantispa Harmandi* (Navás).

Mantispa Harmandi, Navás, Mem. Real. Acad. Cien. y Art. de Barcelona, vii, p. 480 (1909).

Mantispa Sasakii, Miyake, Journ. Coll. Agr. Tokyo, ii, p. 217, pl. xii, figs. 2, 2a, 2b, ♀ (1910).

Eumantispa Suzukii (Mats.), Okamoto, Zool. Anz. xxxvii, p. 294 (1911).

Eumantispa Sasakii, Okamoto, l. c. p. 295.

After a study of the type specimens of both *Sasakii* and *Suzukii* and comparing them with the original description of *Harmandi*, I have come to the conclusion that all the three forms mentioned are identical. I therefore relegate *Sasakii* and *Suzukii* to the list of the synonyms of *Harmandi*.

This species is not at all rare in mountainous wooded regions of Japan, and appears in August and September but especially in the latter month.

2. *Eumantispa Nawae* (Miyake).

Mantispa Nawae, Miyake, Journ. Coll. Agr. Tokyo, ii, p. 216, pl. xii, figs. 4, 4a, 4b (1910).

Eumantispa Nawae, Okamoto, Zool. Anz., xxxvii, p. 294 (1911).

I have no observation of my own concerning this species.

Genus *Mantispa* Illiger.

Illiger, Verz. Käfer Preussens*.

Westwood, Trans. Ent. Soc. Lond., n. s., i, pp. 252-53 (1852).

Walker, Cat. Neuropt. Brit. Mus., pt. ii, p. 213 (1853).

Enderlein, Stett. Ent. Zeit., pp. 344-45, fig. 1 (1910).

(Subgen. *Mantispa* Ill., Enderlein, l. c.; Subgen. *Mantispilla* Enderlein, l. c.)

*This work was unfortunately not accessible to me.

It seems to me that Enderlein's classification of the genus into subgenera based on a certain point of the wing venation, is too arbitrary to be retained. The venation is subject to individual variations to such an extent that it can scarcely be utilized with advantage for the purpose.

3. *Mantispa japonica* MacLachlan.

Mantispa japonica, MacLachlan, Trans. Ent. Soc. Lond., pt. ii, p. 178 (1875); Miyake, Journ. Coll. Agr. Tokyo, ii, p. 220, pl. xii, figs. 5, 5a, 5b, ♂ (1910); Okamoto, Zool. Anz., xxxvii, p. 296 (1911).

Mantispa diminuta, Matsumura, Syst. Ent. (Konchū-bunruigaku), i, p. 169 (1907); *Mantispa* (*Mantispilla*) *diminuta* Mats., Okamoto, Zool. Anz., xxxvii, p. 296 (1911).

I hold that *Mantispa diminuta* of Matsumura is simply a variational form of *Mantispa japonica* MacLachlan, which is very variable in neurulation as well as in the dimensions of body. The smallest and largest individuals differ in dimensions to a rather remarkable extent, so that one might easily be misled to take the extremes for specifically distinct.

Here is a table showing variations in the dimensions of parts and in the neurulation of fore-wing.

Specimen	Locality.	Sex.	Length of body	Length of fore-wing	Width of fore-wing	Length of hind wing	Length of prothorax.	Number of veins arising from 1st radial cell of fore-wing
A	Prov. Iwashiro.	♂	8mm.	10mm.	2.6mm	9mm.	4mm	Single
B	Tokyo	♀	10 "	13 "	3 "	11 "	4 "	Two
C	"	♀	15 "	14 "	4 "	12 "	4.5 "	Single
D	"	♀	14 "	13.5 "	3.5 "	11.5 "	4 "	"
E	Kiushiu	♂	11 "	12.5 "	3 "	10.5 "	4 "	Two

M. japonica is a rather common species in Hondo (the main island of Japan). Also from Kiushiu I have received a series of specimens. It occurs in Korea too.

The adults are usually found among the ground vegetation in forests in the month of June, sometimes in great abundance; in July and August they occur in less numbers.

4. *Mantispa formosana* Matsumura.

Mantispa (*Mantispa*) *formosana* Mats., Okamoto, Zool. Anz., xxxvii, p. 297-98 (1911).

This form known from Formosa is not improbably identical with *M. luzonensis* Navas (Mem. Real. Acad. Cien. Art. Barchelona, vii, p. 479, 1909), though perhaps it may be distinguished as a variety of the latter.

Genus *Climaciella* Enderlein.

Enderlein, Stett. Ent Zeit., p. 360 (1910).

5. *Climaciella subfusca* sp. nov.

Head ochraceous yellow with two black lines on clypeus; maxillary and labial palpi also ochraceous yellow; frons and top of head bright yellow; slightly impressed on each side from the base of antennae along inner margin of eyes; occiput black; antennae with more than 20 joints (some terminal joints lost), about twice as long as head, basal joints ochraceous yellow, all other joints fuscous; eyes black.

Prothorax deep black (probably dark brown in life), with numerous fine transverse impressions; its anterior dilated portion yellowish fuscous, anterior top dusted with dark fulvous.

Meso- and metathorax dark fulvous, with yellow scutella.

Fore-leg ochraceous, raptorial femora and trochantera dusted



Climaciella subfusca, n. sp. ♀. 3×.

with black; tibiae and inner side of femora brownish yellow, outer side of coxae dark yellow.

Mid- and hind-legs also ochraceous with yellow tibia.

Wings hyaline with fuscous veins; their anterior and outer parts broadly light brown, narrowly so along the veins that arise from radial cells; both the wings with three veins from 1st radial cell and three or two veins from 2nd radial cell; anal veins not crotched, but simple; pterostigma wide, light brownish orange.

Abdomen yellow, variegated with fuscous; hind margin of segments mostly black.

Measurements:

Length of body	11.5 mm.
„ „ fore-wing	11 mm.
Width of fore-wing	3 mm.
Length of hind-wing	10 mm.
„ „ prothorax	2.5 mm.

The type is a single female specimen which was captured by Mr. Sōbei Iguchi at Kusakimura in Sayo-gōri, Harima Province, on September 17th, 1907.

The present species is the smallest *Climaciella* known. It is

nearly related to *C. habutsuella* Okamoto, but differs from this markedly in many respects, especially in wing markings and in the size.

6. *Climaciella habutsuella* Okamoto.

Climaciella habutsuella, Okamoto, Zool. Anz., xxxvii, p. 300 (1911).

There are in the collection of the Agricultural College, Tokyo, three specimens of this species from Tanegashima and Yakushima. A specimen in my possession, which was given me by my friend Mr. Kimura, was captured in a small village named Hayano in the Province of Kazusa.

Okamoto stated that the prothorax of the species is deep black, but I have found a Tanegashima specimen which had the prothorax not black but brownish.

This species probably appears in the month of June.

7. *Climaciella 4-tuberculata* (Westwood).

Mantispa 4-tuberculata, Westwood, Trans. Ent. Soc. Lond., n. s., i, 264, pl. xviii, fig. 1 (1852); Walker, Cat. Neuropt. Brit. Mus., pt. ii, p. 225 (1853); Needham, Rec. Ind. Mus., iii, pt. iii, p. 195 (1909).

Climaciella 4-tuberculata Enderlein, Stett. Ent. Zeit., p. 361 (1910); Okamoto, Zool. Anz., xxxvii, pp. 298-99 (1911).

Of this species, only a single female specimen has been received by me from Horisha, Formosa, although it is probably the most common mantispid in that island.

The specimen on hand closely agrees with Westwood's description of *Mantispa 4-tuberculata* except in the apices of the wings being more strongly suffused with fulvous brown than in the *4-tuberculata* described and figured by him.

Typical *4-tuberculata* should be common in the western Himalayas, in Assam and in the northern parts of India.

8. *Climaciella Miyakei* Okamoto.

Mantispa 4-tuberculata, Westwood, Miyake, Journ. Coll. Agr. Tokyo, ii, p. 218, pl. xii, figs. 1, 1a, 1b, ♂ (1910).

Climaciella Miyakei, Okamoto, Zool. Anz. xxxvii, p. 299 (1911).

Rather rare and only occasionally found in the western parts of Hondo (the main island of Japan). I have received three specimens from the Province of Harima.

Prothorax is commonly brown, but sometimes deep black as in *habitsuella*. It is a noteworthy fact that this color variation occurs in *Climaciella*.

Wings are colored fuscous yellow at base and anterior margin, though often very faintly. The apical cloud is always fulvous brown.

This elegant species appears in the months of August and September.

9. *Climaciella magna* (Miyake.)

Mantispa magna, Miyake, Journ. Coll. Agr. Tokyo, ii, pp. 214-16, pl. xii, figs. 3 & 3a-c, ♀ (1910).

Climaciella magna, Okamoto, Zool. Anz., xxxvii, p. 294 (1911).

This magnificent species takes an unique position in the genus on account of the exceedingly large size of body, and also of the fact that the anterior portion of prothorax, which in all other species is stoutly developed in relation with the raptorial fore-legs, is here but slightly dilated. Another peculiarity of the species consists in the presence of a whitish tubercle on the basal joint of antennae. This tubercle has not been mentioned by Miyake in his description.

If the characterizations referred to warrant generic separation of the species from *Climaciella*, may be doubted.

So far as I know, this species is peculiar to Kiushiu.

I think the fact that adult specimens have been obtained in

April as well as in October, points to the species' passing the winter in the state of imago.

Genus **Euclimacia** Enderlein.

Enderlein, Stett. Ent. Zeit., p. 362, fig. 3 (1910).

10. *Euclimacia badia* Okamoto.

Euclimacia badia, Okamoto, Zool. Anz., xxxvii, p. 301 (1911).

This species was discovered in Formosa. No specimen before me.

11. *Euclimacia vespiformis* Okamoto.

Euclimacia vespiformis, Okamoto, Zool. Anz., xxxvii, p. 300 (1911).

This seems to be a species closely allied to *Euclimacia partita* Enderlein (Stett. Ent. Zeit., pp. 366-67, 1910).

No specimen has come under my observation.

Finally I append a table showing the geographical distribution of the mantispid species listed above. The localities outside of Japan, Formosa and Korea I have taken from Enderlein, Needham and Navas.

	Main island of Japan.	Kiushu (Japan)	Formosa	Korea.	Philippines.	Sumatra.	Celebes.	W. Himalayas.	Assam.
1. <i>Eumantispa Harmandi</i>	*								
2. <i>E. Nawae.</i>	*								
3. <i>Mantispa japonica.</i>	*	*		*					
4. <i>M. formosana.</i>			*		* ?	* ?			
5. <i>Climaciella subfusca.</i>	*								
6. <i>C. habutsuella.</i>	*	*							
7. <i>C. 4-tuberculata.</i>			*					*	*
8. <i>C. Miyakei.</i>	*								
9. <i>C. magna.</i>		*							
10. <i>Euclimacia badia.</i>			*						
11. <i>E. vespiformis.</i>			*				* ?		

In conclusion, I beg to acknowledge my indebtedness to Mr. T. Miyake of the Agricultural College, Tokyo Imperial University, for many kind advice and help rendered me during the study.

A New Fresh-water Nemertine from Japan

(*Stichostemma grandis*).

By

Dr. Iwaji Ikeda.

With Plate IV.

On March 29th, 1909, in the Botanic Garden of the Hiroshima Normal School, I have casually discovered a small worm of a leech-like appearance, living in the soft water-covered mud in a vessel which was planted with the aquatic plant *Lisichiton kamtschatense* Schott. When first dug out, it was found entirely contracted within its own mucous secreta, but a little later it cast off the latter and began to creep about, meanwhile unmistakably revealing itself to be a nemertine. Subsequent searches enabled me to obtain about sixty specimens out of the same vessel. The discovery seemed to be of much interest, for, to my knowledge, there previously existed no record of the occurrence of a fresh-water nemertine in Japan, a belief which is shared also by Mr. Takakura of Tokyo, who has long been engaged in the study of Japanese nemertines. Moreover, from subsequent study, it turned out that the nemertine represented a hitherto undescribed species of *Stichostemma*. I propose to call it *S. grandis*. The worms, which were kept in captivity, began to spawn on April 19th, and continued to do so till the end of June, when I had to leave Hiroshima. Then, all the material on hand—both the adults and the eggs—were preserved and placed in storage for future investigation.

Later, in the Zoological Laboratory of the University of Cambridge, England, I was able to take up the study of the above material. As the result, I have found some new points of interest in

the anatomy and histology to be added to the excellent contributions previously made by Montgomery and Böhmig to the knowledge of *Stichostemma* species. As regards the embryology, the limited supply of the material necessarily made my observations very fragmentary. The shortage was especially felt in dealing with the question of cell lineage, a complete study of which seemed to promise very desirable results of high importance. I will now briefly describe the new species with respect to its external and internal organization, and then give what observations I could make regarding its life-habits and the segmentation of the eggs.

Stichostemma grandis n. sp.

External characters.

The worms (fig. 1, Plate IV), when freed from the mucous coat and fully stretched, measure 25-35 mm. in length and 1 mm. in breadth. The head end is rounded and somewhat broader than the tail end. The eyes in the adults always number six, forming three pairs. As in other species of *Stichostemma*, the anterior pair are the largest and the posterior pair the smallest, and the distance between the first and second pairs is slightly longer than that between the second and third. The relative position of the three pairs of eyes may well be understood from fig. 2, which represents the anterior end of a young and rather transparent individual 4 mm. long. In such a young individual all the organs lying on the surface of head are fairly distinctly visible in surface view. Thus, the paired cephalic grooves (*c. v.*), which appear like two comparatively deep and strongly ciliated pits, are seen situated close but ventrally to the lateral margin and just in front of the second pair of eyes. The rhyncho-stomodæal opening (*r. s.*) may also be distinctly seen as a small despression situated slightly ventral to the tip of head. Besides these, there are always to be recognized, though indistinctly in the adult, two conspi-

cuous marginal constrictions (*m.c.*) lying a short way behind the dorsal ganglia (*d.g.*) and reaching to some extent the dorsal side of body.

The adult (fig. 1) always shows a bright yellowish red colour which becomes gradually fainter towards both extremities of the body. For a comparatively long period after hatching, the young are simply milky white; as in *Stichostemma gracense* when grown to a length of 2-3 *mm.*, they acquire a light rosy-red colour. In later stages of growth, the red colour becomes gradually deeper, and at the same time there occurs a new deposition of a dark-green pigment in the form of finely granular spots. These spots increase in number, becoming more and more closely distributed, until the worm attains a length of about 10 *mm.* Thenceforth, while the red continues to deepen, the green pigments become on the contrary fainter and fainter, finally to disappear altogether when the animal is about 15 *mm.* long. In sexually mature individuals there are two longitudinal series, one on each side, of small roundish markings of an ochre-yellow colour (indicated in fig. 1). They are due simply to the presence of mature gonads, each containing several eggs of a yellowish colour.

Even in the fresh state, the proboscis can be detected through the skin as a narrow opaque streak running posteriorly for about three-fifths of the body-length (see fig. 1). Of course, this apparent length does not cover the actual extent of the whole organ, since the rhynchocoel, when traced by means of sections, are found to extend as far back as the beginning of the posterior one-third of the body.

The entire surface of the worm is uniformly ciliated. Sensory spines, such as occur in *Stichostemma gracense*,¹⁾ are not present.

Internal characters.

The stomodæum and the rhynchodæum are united into a common

1) Böhmig, L., Beiträge zur Anatomie und Histologie der Nemertinen (*St. gracense* Böhmig, *Geonemertes chalicophora* Graff), Zeitschr. f. Wiss. Zool., Bd. 64, 1898.

spacious cavity, the stomo-rhynchodæum, which opens to the exterior at a position slightly ventral to the extreme tip of head. The true mouth leads posteriorly into the œsophagus, which is followed by the stomach, the pyloricus, and the intestine successively. From the dorso-lateral corners of the pyloricus there arise two long anteriorly directed cæca (*cc.*, fig. 3), which reach up to the brain (*dg.* and *vg.*). These cæca seem to be structurally identical with the intestinal cæca, which occur along the entire length of the intestine and number about 90 on each side.

As before indicated, the rhynchocœl may correspond in its range approximately to two-thirds of the body-length. This is the case with the adult. But in the younger specimens, say in those just hatched, the cavity is relatively much longer, occupying about nine-tenths of the body-length. As the growth advances, the rhynchocœl also grows in length, but somewhat more slowly than the entire body; so that, at a stage when the latter has attained a length of 10 mm., the former is about four-fifths as long, and finally in full-grown individuals its length is equal to about two-thirds of the body-length.

As to the morphology of the proboscis-stylets (chief and accessory) and of the stylet-sac, the present species more nearly agrees with the description given by Böhmig from *Stichostemma gracense* than that by Montgomery from *St. eilhardi*.¹⁾ One point worth mentioning is the fact that, so far as my observations go, the number of accessory stylets in each sac or "acanthocyst" is 3.

One peculiarity of the present species consists in the fact that the proboscis-nerves are not definitely fixed in number, being either 9 or 10 according to individuals. I have not examined enough specimens to be able to decide which of the numbers is the predominant. Nevertheless, it may safely be stated that this variation in number is not due to secondary separation or coalescence of the nerves.

1) Montgomery, T. H., *Stichostemma Eilhardi* nov. gen., nov. sp. Zeitschr. f. Wiss. Zool., Bd. 59, 1895.

As to histological characters of the frontal and cephalic organs, I have found nothing peculiar to the present species. The same may be said of the central nervous system and also of the number and distribution of the cephalic nerves. Only there exists a not unimportant point of deviation from Böhmig's description for *St. gracense*, with respect to the origin of that cephalic nerve which distributes itself to the cephalic organ. According to him, the nerve in question originates from the frontal surface of the dorsal ganglion. This is decidedly not the case in the present species; here, that nerve arises from about the middle of the posterior surface of the said ganglion and turns round the outer ventral side of it to join the bottom of the cephalic organ.

As was pointed out by Böhmig in *St. gracense*, the lateral nerve-stems contain very fine muscle-fibres imbedded in the substance of the nervous tissue. In contrast to the muscle-fibres being in that species variable in number, they are in the present species so definite in number and position that there are constantly 2 of them to be found in every part of the stem, always lying in the inner dorsal part of the fibrous layer. I have not been able to trace, as Böhmig did, these muscle-fibres passing out of the brain to the proboscis-musculature. It seems to me probable that they do not do so at all but end in the brain.

One word with reference to the vascular system. This in the present species may be said to agree well with that of *St. gracense*. Accordingly, I have found the very same junction between the dorsal and the right lateral vessels as that which was described and figured by Böhmig from *St. gracense*. The junction occurs just behind the dorsal commissure of the brain.

As to the distributional range of the excretory organs, the present species agrees with the others already known. In fact, they are present nearly throughout the whole length of body, extending from in front of the brain to the posterior body-end. I have not yet examined a sufficient number of specimens to be able to give the

exact number of external openings of the excretory system. It may however be stated that there exist more than one—very probably three or four—openings on each side.

The number of mature hermaphroditic gonads varies remarkably with the different size of mature worms. As ascertained by rearing up the embryos hatched from eggs, the worms enter early into sexual maturity, even before completely acquiring the characteristic appearance of full-grown individuals. About two months after egg-deposition, I found a number of small individuals which had developed from the eggs, measuring scarcely over 10 *mm.* in length, but already possessing about twenty pairs of fully developed gonads. All these small worms were of a dark green colour, instead of being deep yellowish red as in real adults. That they were precociously mature individuals, is evident from the following facts (see figs. 4 and 5): the parenchymatous tissue (*p. c.*) is on the whole far less developed, the nephridial canals (*neph.*) are less numerously branched, and the wall of alimentary tube (*int.* and *oes.*) less complicated in structure, than in really full-grown individuals. Examining a complete series of sections of one such form, I have found about eighty pairs of gonads, of which about twenty pairs may be said to have been mature and the rest still immature. The mature gonads (see fig. 4) were in general much smaller than those found in full-grown individuals, each of them containing mostly only one and rarely two ripe eggs (*e.* in fig. 4).

In full-grown worms of yellowish red colour, there exist about eighty pairs or more of ripe gonads, each containing three or four egg-cells. These gonads, as also the precociously mature ones, are of essentially the same structure as those described by previous observers from *St. eilhardi* and *St. gracense*. This is also the case with the immature gonads. Only I should emphasize one point with reference to the hermaphroditism. After examining a fair number of the specimens preserved during the breeding season, I have arrived at the conclusion that in the present species both sorts of sex-cells come

to maturity almost simultaneously. So long as the egg-cells remain in the earlier stages of growth and are still attached to the gonad-wall, no spermatid or spermatozoon is yet formed and the male elements are represented by a few small masses of spermatogonia or spermatocytes, nearly all of which show division-figures. Of course these cell-masses still lie in the epithelium, mostly in close vicinity of the funnel-shaped mouth of the genital duct. In the eggs, the later phases, during which they reach maximum size and are brought to complete maturity ready for deposition, are indicated: first, by their liberation from the gonad-wall; secondly, by rearrangement of nucleoli from a localized disposition with tendency to accumulate at the ventralmost corner of the germinal vesicle, into a regular peripheral distribution; thirdly, by the development of the two egg-membranes. Nearly simultaneously with, or a little prior to, the processes mentioned above, the spermatids make their first appearance, subsequently to undergo metamorphosis. This metamorphosis takes place in some parts of a gonad a little earlier than the liberation of the eggs, so that in many gonads there are to be seen fully formed free spermatozoa in accompany with eggs which have not yet reached the final maturation-stage. Nevertheless, the interval between the maturing of the male and female elements is never so long as to cause protandric hermaphroditism like that of *St. eilhardi*.

So much for the more important characters of the present species as seen from the systematic point of view. A brief discussion will now follow regarding its systematic relations to the allied forms known.

It will not be necessary to enter into a historical or critical review of fresh-water nemertines, as this has already been thoroughly done by Silliman¹⁾ and more recently by Montgomery (1895) and Böhmig (1898). Setting aside for the present the question of the validity or non-validity of the several species that have hitherto been

1) Silliman, W.A., Beobachtungen über Süßwasserturbellarien Nord-Amerikas. Zeitschr. f. Wiss. Zool., Bd. 41, 1885.

described by the authors, we will here consider the more important question whether all the known fresh-water nemertines should properly be regarded, as Bürger¹⁾ does, to constitute the single genus *Tetrastemma*, or, as Montgomery and Böhmig believe, to belong to two genera *Tetrastemma* and *Stichostemma*.

The genus *Stichostemma* was first established by Montgomery in 1895, when he described a new fresh-water nemertine from Berlin (*Stichostemma eilhardi*). A year later, the same writer²⁾ described another new species (*St. asensoriatum*), belonging to the same genus. In 1898 Böhmig redescribed his former *Tetrastemma gracense* as the third species of *Stichostemma* (*St. gracense*). The grounds for erecting that new genus were given by Montgomery³⁾ in 1897, and the distinction he makes between *Tetrastemma* and *Stichostemma*, which two genera cover all the known fresh-water nemertines, will be clear from a comparison of the diagnoses given by him to each. For *Stichostemma* he gives :

“Eyes variable in number, usually more than 4; 9 nerves in the proboscis; rhynchocœl does not extend to the posterior end of the body; nephridia extending from in front of the brain to the posterior end of the body; protandric, hermaphroditic, oviparous.”

And for *Tetrastemma* :

“Eyes not variable in number, either 4 single eyes (the rule), or 4 double eyes (*T. falsum*, *cruciatum*); 10 nerves in the proboscis; rhynchocœl extends to the posterior end of the body; nephridia not extending posteriorly behind the œsophagus, diœcious, oviparous.”

Despite Bürger's disapproval (1895 and 1904) of establishing the the new genus *Stichostemma*, Böhmig adopted Montgomery's view in consideration of important differences between the two genera in

1) Bürger, O., Die Nemertinen des Golfes von Neapel etc. F. u. Fl. d. Golfes von Neapel, 1895. And also in “Das Thierreich,” 1904.

2) Montgomery, T.II., *Stichostemma asensoriatum* n. sp., a Fresh-water Nemertean of Pennsylvania. Zool. Anzeig., Bd. 19, 1895.

3) Montgomery, T.II., On the Connective tissues and Body-Cavities of the Nemerteans, with Notes on Classification. Zool. Jahrb., Abth. f. Anat. etc., Bd. 10, 1897.

question with regard to their excretory organ, their rhynchocoel, and very probably, to their rhyncho-stomodæum and hermaphroditism as well. However, upon finding some incongruous points in Montgomery's definition of *Stichostemma* when applied to the two species, *St. asensoriatum* and *gracense*, Böhmig (1898) has revised the generic diagnosis as follows:

“Augenzahl veränderlich, gewöhnlich mehr als 4; 9 oder 10 Rüsselnerven; das Rhynchocoelom erstreckt sich nicht bis an das Körperende; die Nephridien dehnen sich von der Gegend des Gehirns bis zur hinteren Körperspitze; zwittrig, ovipar.”

I take this definition of *Stichostemma* to be excellently drawn up, sharply differentiating, as it does, that genus from the other. No emendation to it is made necessary by the discovery of the new species described in this paper.

On the following page is given a tabular list of the more important characters of the three hitherto known species and of the present new species of *Stichostemma*.

A glance at that table will show that the present species is more closely related to *St. eilhardi* than to any other of the species, and that *St. asensoriatum* takes an isolated position in that it lacks the frontal organ and is provided with an indefinite number of eyes. The relation between the present species and *St. gracense*, in spite of several points of agreement in internal anatomy, seems to be comparatively remote, since the two species differ markedly from each other in size and colour of body, in the presence or absence of sensory spines, in the extent of cephalic glands, *etc.* With respect to the last-named organ, the present species bears a singular resemblance to the otherwise remotely allied member, *St. asensoriatum*. It is also a noticeable fact that the present species shows, as regards the number of proboscis-nerves, an intermediate or transitional relation to the three other species. As already stated in the foregoing description, the said nerves number 9 or 10 in the present species, the variation

	Maximum body-length.	Colour.	Frontal organ.	Sensory spines.	Eyes.	Proboscis-nerves.	Cephalic glands.	Gonads.	Hermaphroditism.
<i>St. gracise.</i>	12 mm.	Yellowish-brown to reddish brown.	Present.	Present.	6.	10.	Well developed posteriorly, reaching to the brain.	About 35 on each side in the largest individual; 18 of them ripe.	Both sex-cells ripen simultaneously.
<i>St. eilhardi.</i>	14 mm.	Reddish yellow.	Present.	Wanting.	6.	9.	Well developed, nearly reaching to the brain.	42 on each side in a full grown individual; all ripe.	Protandric.
<i>St. asensoriatum.</i>	18 mm.	Bright orange.	Wanting.	Wanting.	Mostly 6; sometimes 5, 7, or 8.	10.	Weakly developed.	?	Protandric.
<i>St. grandis.</i>	35 mm.	Bright yellowish red.	Present.	Wanting.	6.	9 or 10.	Posteriorly not extending beyond the level of the second pair of eyes.	About 80 on each side; all ripe.	Both elements ripen simultaneously.

being apparently entirely idiosyncratic. It is, of course, a well known fact that the number of proboscis-nerves is in many other groups of nemertines variable to some extent even in one and the same species; consequently, it cannot be much utilized for systematic purpose. This seems however not to apply to the three hitherto known species of *Stichostemma*, in which the number is definitely known to be either 9 or 10. This fact has induced me to regard the indefiniteness in the number of proboscis-nerves in the present species as one point of its specific peculiarities.

Lastly, the remarkably large size of the present species deserves special mention, as this seems to be correlated with several important characters of the species, for instance, with the unusually large number of mature gonads, with the comparatively short extent of the rhynchocoel, *etc.* From what I have described in a previous paragraph, it will readily be seen that the characteristic points just referred to undergo more or less remarkable changes, according to certain stages of growth, even after the animals have actually entered into sexual maturity. While the maturing gonads increase in number as the animals grow larger, the cephalic glands and the rhynchocoel tend to become reduced in their relative range of extent. So that, if the worms in widely different stages of growth be obtained from different localities, it would be more or less puzzling to determine whether or not they should be brought under the same species. It is interesting to notice that the four species, if arranged in the order of their body-lengths, as they are in the foregoing table, seem to show between them certain relations similar to those which I have pointed out in the present species with reference to different stages of its individual growth on the one hand, and the number of mature gonads and the relative extent of cephalic glands on the other. If this idea be correct, an explanation suggests itself why the two such remotely related species as *St. asensoriatum* and the present species show the singular agreement in having cephalic glands of a similarly low develop-

ment. I think it highly probable that the relative extent of rhynchocoel in the four species also varies inversely with the size of each; that is, it should be of the largest extent in the smallest form, and *vice versa*. But this can not certainly be insisted upon without exact measurements of the organ in all the known species.

The Life-habits.

As to the original habitat of the plant, *Lysichiton kamtschatense*, I have made some inquiries, in view of the possibility that the animals were transported together with the plant from somewhere to the garden. But I could receive no satisfactory information, except that the plant is a form indigenous in Hokkaidō as well as in some parts in the north of the Main Island or Honshū. Anyway, it seems certain that this Japanese species of *Stichostemma* belongs to the temperate-subarctic fauna as do also all the known species (*St. cilhardi* from Berlin, *St. asensoriatum* from Pennsylvania, and *St. gracense* from Gratz).

As to the life-habit of the species in the plant-vessel, they were always found buried 1-2 cm. deep in the very soft mud and almost always in a contracted state within the mucous secreta,—never found creeping on the bottom, nor swimming in the water. The worms showed a fairly strong tendency to negative heliotropism, so that, when kept in a small vessel, they crept about on the surface of mud during night or early in the morning, but went underneath the mud when bright sun-shine pervaded the room. They are more or less gregarious, as often observed by me in the culture-vessels and in the plant-vessel. Most of the specimens in hand were dug out from among the plant-roots, where they were found crowded together.

The negative heliotropic habit of the worms seems to be directly related with the nocturnal spawning. During nearly 70 days, from the 19th of April to the end of June, I have observed twenty or more cases of spawning but never in the day-time. Judging from the fact

that freshly deposited eggs were found in mornings (6 to 8 *a.m.*) always in so early a stage of segmentation as consist of 2 or 4 cells, it may be assumed that the deposition took place before dawn. I should here mention that the eggs segment very slowly, some forty to sixty minutes being required for one complete cell-division in early cleavages.

Individuals of a large size lay 400 to 500 eggs in all. The eggs are found sometimes scattered about without order on the bottom of the vessel, and sometimes in a group, as described by Lebedinsky¹⁾ (1897) for *Tetrastemma vermiculus*, enclosed in a colourless and transparent jelly-like string 4 to 5 *cm.* long and about 2 *mm.* thick. This gelatinous, substance, probably mucin in nature, gradually grows more liquid-like with the lapse of time, and finally, within 48 hours, is thrown off by the developing embryos.

As far as my observations go, the mother worm perishes sooner or later after spawning. Those individuals which have finished spawning can easily be recognized by their loss of the peculiar yellowish markings which were visible before on the dorsal side, by their dirty brownish red colour, and by their showing unevenness of body-surface. In spite of my attempts to keep alive such individuals by feeding they invariably broke up into short pieces within one or two days finally to become totally disintegrated. To my regret I could not ascertain if the same or a similar fate befall the precociously mature worms after spawning.

Lastly I may be allowed to make a few remarks regarding the segmentation of the eggs. As the segmentation of nemertine eggs is but meagrely known to us, I have endeavoured to study the process with the material in hand and, if possible, to make out the origin of mesoderm-cells. To my regret, shortage of material has compelled

1) Lebedinsky, J., Beobachtung über die Entwicklungsgeschichte der Nemertinen. Archiv. f. Mikr. Anat., Bd., 49, 1897.

me to give up my studies long before obtaining any hint towards elucidating the question. The segmentation I have been able to follow up only as far as the 64-cell stage, in which no directive cleavage determining the future body-axes has as yet set in. As to the general mode of segmentation, the present case belongs to the perfectly spiral type which prevails in some other nemertines as well as in polyclads, polychaetes, echiuroids and molluscs. The process proceeds to the 28-cell stage in much the same way as was described by E. B. Wilson¹⁾ for *Cerebratulus lacteus* and by Zeleny²⁾ for *Cerebratulus marginatus*, except in the fact that the first dextrotropic cleavages giving rise to the 8-cell stage are equal instead of being unequal. In the accompanying table is given the order of cell-division up to the 64-cell stage, *dt.* and *lt.* being used to denote dextrotropic and laetotropic divisions. The sign = denotes equal division; \perp or \top , unequal division; and $\perp\!\!\!\perp$ or $\top\!\!\!\top$, markedly unequal division of blastomeres giving rise to the upper or lower larger cells.

As in *Arenicola cristata* studied by Child,³⁾ the rosette cells ($1a_{111}$, etc. in textfigs. I and II) are first formed at the 36-cell stage by remarkably unequal laetotropic divisions of the cells $1a_{11}$, etc. of the 32-cell stage into $1a_{111}$ and $1a_{112}$, etc. The 44-cell stage is reached by two simultaneous equal and laetotropic divisions of $1a_{21}$, etc. and $1a_{22}$, etc. of the first quartet into $1a_{211}$ and $1a_{212}$, $1a_{221}$ and $1a_{222}$, etc. etc. (see text figures I and II). After that, the 48-cell stage is brought about by equal and laetotropic divisions of $1a_{12}$, etc., which correspond to the intermediate cells of polychaete-eggs, into $1a_{121}$ and $1a_{122}$, etc. The cells $1a_{121}$, etc. are situated each at the apex of the cross-figure formed by the rosette cells ($1a_{111}$ etc.). A remarkably unequal cleavage is seen in

1) Wilson, E.B., Experiments on Cleavage and Localization in the Nemertine Egg, Arch. f. Entw.-Mech., Bd. 16, 1903.

2) Zeleny, Ch., Experiments on the Localization of Developmental Factors in the Nemertine Eggs. Journ. Exp. Zool., Vol. 1, 1904.

3) Child, C.M., The Early Development of *Arenicola* and *Sternaspis*, Arch. f. Entw.-Mech., Bd. 9, 1900.

the divisions of $2a_2$, *etc.* into $2a_{21}$ and $2a_{22}$, *etc.*, which lead the egg into the 52-cell stage. As this cleavage goes on quite similarly, —c. i. laeotropically—in the four quadrants, there appears no trace of asymmetry to determine the subsequent bilateral symmetry. The stage consisting of 52 cells is rather transient, since the cells $2a_1$, *etc.* very soon follow the above cleavage to divide slightly unequally into $2a_{11}$ and $2a_{12}$, *etc.*

The formation of the fourth quartet ($4a$, *etc.*) takes place at the 56-cell stage, while the first division in the third quartet ($3a$, *etc.* into $3a_1$ and $3a_2$, *etc.*) occurs at the 60-cell stage, thus giving rise to the 64-cell stage. These cleavages are likewise effected by equal and laeotropic division, and accordingly do not give any determination to the future bilateral symmetry. I have observed some eggs consisting of 72 cells. They have probably arisen from the 64-cell stage by dextrotropic division of such cells in the first quartet as $1a_{111}$, *etc.* (the rosette) and $1a_{112}$ *etc.*—the latter corresponding to the stem-cells of the “cross” in polychaete eggs—into $1a_{1111}$ and $1a_{1112}$ *etc.*, $1a_{1121}$ and $1a_{1122}$ *etc.* But I cannot be certain on this point, since I have not actually detected any division-figures causing the supposed cleavages.

To recapitulate, the segmentation-process belongs, as in the case of *Cerebratulus lacteus* observed by Wilson, to a very regular spiral type and shows in its earlier phases no directive cleavage determining the axes of embryo and the origin of mesoderm. As was pointed out by Wilson in his case, the cross formation takes place in the present case also at least not earlier than in the 72-cell stage. Though I cannot make any definite statement about the origin of the mesoderm, yet it seems almost certain to me that Lebedinsky's view of the origin of mesodermal bands from four mother-cells does not hold good in the present case. Here, the mesodermal bands are present in a pair as was observed by Wilson also, and are produced by two large cells which lie symmetrically one on each side of, and near the postero-lateral lip of, the gastral invagination.

In conclusion, I beg to express my sincere thanks to Professor Punnett, Professor of Biology in the University of Cambridge, to whom I owe many kind advices during the execution of this work.

Zoological Laboratory,
University of Cambridge.
May, 1911.

Explanation of Plate IV.

- Fig. 1. *Stichostemma grandis* n. sp. A large individual, sketched from life, magnified 2 diameters. For the sake of facilitating reproduction, alterations were made in the original coloured drawing in representing red by black and yellow by white.
- Fig. 2 Head region of a young animal about 4 mm. long. Greatly enlarged. *c.g.*, cephalic groove; *d.g.*, dorsal ganglion; *m.c.*, marginal constrictions behind the brain; *r.s.*, rhycho-stomodaeal opening.
- Fig. 3. Anterior parts of a frontal section of head. *c.c.*, pyloric caeca; *c.g.*, cephalic groove; *c.n.*, cephalic nephridia; *pb.*, proboscis (partly protruded); *v.g.*, ventral ganglion. Magnified about 90 diameters.
- Fig. 4. Cross-section through the middle region of a small but already mature individual about 10 mm. long. *d.v.*, dorsal vessel; *e.*, eggs in the gonads; *g.d.*, genital duct; *int.*, intestine; *int. c.*, intestinal caeca; *l.n.*, lateral nerve; *l.v.*, lateral vessel; *sp.*, spermatozoa in the gonads. Magnified about 90 diameters.
- Fig. 5. Cross-section through head of the same individual, passing through the front end of brain. *ze.*, third left eye-spot; *as.*, oesophagus; *pb.*, proboscis in rhynchocoel. Magnified about 90 diameters.
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On a New Species of *Chloromyxum* from the Gall-bladder of the Carp.

By

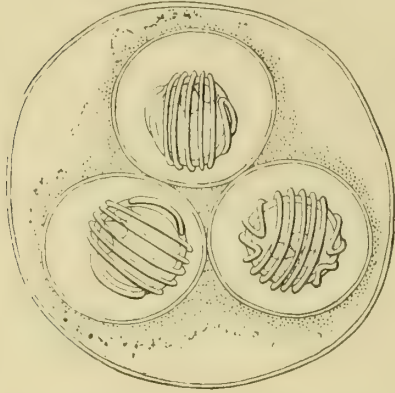
T. Fujita

Tōhoku Imp. University, Sapporo.

In view of the fact that Myxosporidian parasite has never yet been reported from the gall-bladder of the common carp, I deem it worth while to give the following account of an apparently new *Chloromyxum* species, which I have discovered in the said organ of that fish. The species I propose to call *C. koi*, from the Japanese name of the host.

During May, 1912. there came under my observation that, of the numerous carps obtained in Sapporo, Hokkaido, and examined by me, many were peculiarly pathologically affected. These showed gall-bladder of an unusually reddish colouration, due to the contents being of that colour; moreover, it was generally found to be much distended, while the wall was changed into so delicate a texture that it easily burst on application of a slight pressure. The peritoneal membrane in the neighbourhood of the organ so affected frequently presented a somewhat greenish yellow hue, evidently as the result of exudation of the bile. In certain cases a similar colouration was also observable in the external skin of the dorsal body-parts and sometimes even in the iris of the eyes. Now examining the gall-badder of the fish presenting more or less the above icteric symptom, I have always been able to discover peculiar Myxosporidian sporoblasts and spores floating in the contents. I have found that nearly 10% of the carps that were brought to me were infested by the parasite. The characters of the spores indicate that we have here to do with a

Chloromyxum, which however differs in structural details from any hitherto known species of that genus.



A sporoblast of *Chloromyxum koi* containing three spores. Greatly magnified.

The sporoblasts in question are colourless, transparent, and of an approximately spherical shape, up to 50μ in greatest diameter (see the accompanying figure). They contain 1—3 spores, each situated in a clear space surrounded by a membranous envelope, around which there is some finely granular matter. The spores, found either in the sporoblasts or free in the fluid contents of the gall-bladder, are nearly

spherical but not quite, exhibiting, as they do, a somewhat angular contour at the anterior pole. So that, the antero-posterior diameter is always a little prolonged over the transverse. The two diameters in most cases measure 16μ and 10μ respectively. The shell of the spore is rather thick and is characterized by showing a number of peculiarly arranged, low and narrow but well marked ridges on the external surface. There exist in the first place, four or five circular ridges which completely encircle the spore: they run nearly parallel with one another and together occupy a broad zone that pass over the anterior and posterior poles. In the next place, there are, in each of the two lateral areas on both sides of the median circular zone just indicated, four more ridges running meridionally and which, if prolonged at their either end, would strike the first mentioned circular ridges at some angles. As a matter of fact, however the four lateral ridges form two pairs lying side by side, in each of which the two ridges are joined together at both their ends and thus form a loop at each end before reaching the median zone. So that, when a spore is viewed from the side of its either pole, there are to be seen in the

middle parts four or five ridges running across in nearly parallel lines and on both sides of these two more ridges each bent in a loop-like manner. In equatorial optical section, the spore presents an outline very much like that of a toothed wheel with nearly equidistant teeth, i.e. the ridges in optical section, either sixteen or eighteen in number.

Each spore contains four polar capsules as in all other members of *Chloromyxum*. They are situated in the slightly pointed anterior pole. Two of them are somewhat larger than the rest, attaining a diameter of about 4μ . By application of a stimulating reagent, the capsules can be easily made to throw out the filament. This may be 64μ long.

To my knowledge, there have hitherto been known in all ten species of *Chloromyxum*. Of all these, *C. cristatum* Léger (from the gall-bladder of *Tinca vulgaris*) seems to be most nearly related to the present species, inasmuch as it possesses a number of similar meridionally disposed ridges on the exterior of spores. But these ridges differ markedly in their number and mode of arrangement from the same of *C. koi*. Moreover, both the sporoblasts and spores of the latter seem to be considerably larger, the spores of *C. cristatum* being known to be not more than 10—11 mm. in longest diameter.

A Hand-List of Japanese and Formosan Mammals.

By

B. Aoki, *Rigakushi*.

The following list was compiled in connection with my study of the mammalian fauna of Japan. In spite of the incompleteness in several respects, of which I am fully aware, it is now published, on suggestion of Professor Ijima, with the view of giving a guide to the collectors and students of mammals of this part of the world.

It should here be mentioned that the list is in reference principally with the mammals thus far recorded from the islands of Japan proper and from Formosa. Saghalien was included within the range of dealing; however, since Nikolsky's important paper (43) on the fauna of that island stood inaccessible to me, it is possible that omissions may have occurred with regard to the mammals of the said island. As to the arrangement of orders and families, I have chiefly followed Max Weber (70), and to a certain extent G. S. Miller (39) and Flower and Lydekker (23).

Important literature bearing on the mammals of Japan and of Formosa:

1. ALLEN, J. A. History of North American pinnipeds. A monograph of the walruses, sea-lions, sea-bears. 1880.
2. ALLEN, J. A. A review of some of the North American ground squirrels of genus *Tamias*. Bull. Amer. Mus. Nat., Hist., iii, p. 45. 1891.
3. ALLEN, J. A. A review of some of the North American ground squirrels of genus *Tamias*. Bull. Amer. Mus. Nat. Hist., iii, p. 116. 1891.

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61. THOMAS, O. The Duke of Bedford's zoological expedition in eastern Asia.

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Ord. INSECTIVORA.**Sub-Ord. LIPOTYPHLA.****Fam. TALPIDÆ.****Sub-Fam. Myogalinæ.****Gen. *Urotrichus* Temm.**

Urotrichus, Temminck, Fauna Japonica, Mamm., p. 22 (1842);
Thomas, P. Z. S., 1912, p. 131.

1. *Urotrichus talpoides talpoides* Temm.

Urotrichus talpoides, Temminck, Fauna Japonica, Mamm., p. 22
(1842); Günther, P. Z. S., 1880, p. 440; Thomas, *ibid.*, 1905, ii, p. 346;
ibid. 1908, p. 49.

NOM. JAP. Yama-mogura or Himizu-mogura.

DIST. Kiūshiū (Thomas).

2. *Urotrichus talpoides adversus* Thos.

Urotrichus talpoides adversus, Thomas, P. Z. S., 1908, p. 49.

DIST. Tsushima (Thomas).

3. *Urotrichus talpoides centralis* Thos.

Urotrichus talpoides centralis, Thomas, P. Z. S., 1908, p. 50.

DIST. Shikoku (Thomas).

4. *Urotrichus talpoides hondonis* Thos.

Urotrichus talpoides pilirostris, Thomas, P. Z. S., 1905, ii, p. 342.

Urotrichus talpoides hondonis, Thomas, P. Z. S., 1908, p. 51.

DIST. Hondō (Thomas).

Gen. *Dymecodon* True.

Dymecodon, True, P. U. S. Nat. Mus., 1886, p. 97; Thomas, P. Z. S., 1908, p. 51 (foot-note); *ibid.*, 1912, p. 131.

5. *Dymecodon pilirostris* True.

Dymecodon pilirostris, True, P. U. S. Nat. Mus., 1886, p. 97; Thomas, P. Z. S., 1908, p. 51 (foot-note).

NOM. JAP. Hime-yama-mogura or Hime-himizu-mogura.

DIST. N. Hondō (Thomas).

Sub-Fam. Talpinæ.

Gen. *Mogera* Pomel.

Mogera, Pomel, Trouessart, Cat. Mamm. vivent. et foss. (1898-1899).

6. *Mogera insularis* (Swinhoe).

Talpa insularis, Swinhoe, P. Z. S., 1862, p. 10; *ibid.*, 1870, p. 620.

NOM. ANG. Formosan blind mole.

DIST. Formosa (Swinhoe).

7. *Mogera wogura wogura* (Temm.).

Talpa wogura, Temminck, Fauna Japonica, Mamm., p. 19 (1842).

Talpa mizura, Günther, P. Z. S., 1880, p. 440.

Mogera wogura, Thomas, P. Z. S., 1905, ii, p. 341.

NOM. JAP. Mogura. NOM. ANG. Japanese mole.

DIST. Hondō (Thomas).

8. *Mogera wogura kanai* Thos.

Mogera wogura kanai, Thomas, P. Z. S., 1905, ii, p. 361; *ibid.* 1908, p. 49.

DIST. Yaku-shima (Thomas).

9. *Mogera wogura kobeæ* Thos.

Mogera wogura kobeæ Thomas, Ann. Mag. N. H., (7), xv, p. 487, (1905).

DIST. Shikoku, S. Hondō (Thomas).

Fam. SORICIDÆ.

Gen. *Sorex* Linn.

Sorex, Linnæus, S. N., (10), p. 53 (1758); Dobson, P. Z. S., 1890, p. 49.

10. *Sorex daphænodon* Thos.

Sorex daphænodon, Thomas, P. Z. S., 1907, p. 407.

DIST. Saghalien (Thomas).

11. *Sorex howkeri* Thos.

Sorex howkeri, Thomas, P. Z. S., 1905, ii, p. 339.

DIST. Hondō (Thomas).

12. *Sorex minutus gracillimus* Thos.

?*Sorex pygmæus*, Schrenck, Amur Land, Mamm., p. 107 (1859).

Sorex minutus gracillimus, Thomas, P. Z. S., 1907, p. 408.

DIST. Saghalien (Thomas), ?Amur region (Schrenck).

13. *Sorex shinto shinto* Thos.

Sorex shinto, Thomas, Abstr. P. Z. S., no. 23, p. 19 (1905); ibid. P. Z. S., 1905, ii, p. 337.

DIST. Hondō (Thomas).

14. *Sorex shinto sævus* Thos.

Sorex shinto sævus, Thomas, P. Z. S., 1907, p. 408.

DIST. Hokkaidō, Saghalien (Thomas); Kuril Islands?

15. *Sorex unguiculatus* Dobs.

Sorex vulgaris, Schrenck, Amur Land, Mamm., p. 106 (1859).

Sorex unguiculatus, Dobson, Ann. Mag. N. H., (6), v, p. 115 (1890); Thomas, P. Z. S., 1907, p. 407.

NOM. JAP. Ōashi-jinezumi. NOM. ANG. Large-footed shrew.

DIST. Hokkaidō, Saghalien (Thomas); Kuril Islands.

16. *Sorex* sp.

Sorex sp., Swinhoe, P. Z. S., 1854, p. 382; *ibid.*, 1870, p. 620.

DIST. Formosa (Swinhoe).

17. *Sorex* sp.

Sorex sp., Bonhote, Novit. Zool., ix, no. 3, p. 628 (1902).

DIST. Liūkiū (Bonhote).

Gen. *Soriculus* Blyth.

Soriculus, Blyth, J. A. S. B., x xiv, p. 37 (1885).

18. *Soriculus fumidus* Thos.

Soriculus fumidus, Thomas, Ann. Mag. N. H., (8), xi, p. 216 (1913).

DIST. Central Formosa: Mt. Arizan (Thomas).

Gen. *Chodsigoa* (Kaščenko).

Chodsigoa, Kaščenko, Ann. Mus. Zool. Acad. Sc. St. Petersburg, x, 1905, p. 251 (Subgen.).

19. *Chodsigoa sodalis* Thos.

Chodsigoa sodalis Thomas, Ann. Mag. N. H., (8), xi, p. 217 (1913).

DIST. Central Formosa : Mt. Arizan (Thomas).

Gen. *Crocidura*¹ Waglar.

Crocidura, Wagler, Isis, 1832, p. 275 ; Dobson, P. Z. S., 1890, p. 50 ; Blanford, Fauna Brit. Ind. Mamm., p. 231 (1888—91).

20. *Crocidura cærulea* (Kerr).

Sorex cæruleus, Kerr, Anim. Kingd., p. 207 (1792).

Sorex pilorides, Shaw, Mus. Lever., ii, p. 31 (1796). (Nec *Mus pilorides* Pallas).

Sorex cærulescens, Shaw, Gen. Zool., i, p. 538 (1800) ; Blyth, J. A. S. B., xxiv, p. 25 ; ibid. Cat., p. 82 ; Jerdon, Mamm. p. 58.

Sorex indicus et *capensis*, Geoffroy, Ann. du Mus., xvii, pp. 183, 184 (1811).

Sorex sonneratii et *giganteus*, Geoffroy, Mém. du Mus., xv, pp. 132, 137 (1827).

Sorex myosurus, Gray, Hardwicker's, Ill. Ind. Zool., i, pl. ix (nec Pallas.)

Sorex indicus, Temminck, Fauna Japonica, Mamm., p. 25 (1844).

Sorex murinus, Hodgson, Ann. Mag. N. H., (1), xv, p. 269 (1845) ; Kelaart, Prod., p. 30 (nec Linn.)

Crocidura (Pachyura) waldemarii, *ceylanica* et *media*, Peters, MB. Ak. Berl., 1870, pp. 590, 591 et 592.

Crocidura (Pachyura) fulvo-cinerea et *sindensis*, Anderson, J. A. S. B. xlv, pt. 2, pp. 263, 266.

Crocidura cærulescens et *beddomii*, Anderson, Cat., pp. 171, 179.

Crocidura cærulea, Blanford, Fauna Brit. Ind., Mamm., p. 236 (1888—91) ; Flower, P. Z. S., 1900, p. 337.

Crocidura (Pachyura) cærulea, Bangs, Amer. Nat. xxxv, No. 415, p. 561 (1901).

1) Other synonyms of Gen. *Crocidura* are as follows (Blanford) :—
Pachyura Selys-Longchamps, *Feroculus* Kelaart.

NOM. JAP. Jakō-nezumi. NOM. ANG. Gray musk shrew.

DIST. India, Ceylon, Burma (Blanford); Japan: Liūkiū (Bangs); Kiūshiū (Temminck).

21. *Crocidura coreæ* Thos.

Crocidura coreæ, Thomas, P. Z. S., 1906, ii, p. 860; *ibid.*, 1907, p. 462; *ibid.*, 1908, pp. 51, 633.

DIST. Tsushima, Corea (Thomas).

22. *Crocidura dsi-nezumi dsi-nezumi* (Temm.).

Sorex dsi-nezumi, Temminck, Fauna Japonica, Mamm., p. 26 (1844).

Crocidura (*Crocidura*) *dsi-nezumi*, Thomas, P. Z. S., 1905, ii, p. 340.

NOM. JAP. Ji-nezumi.

DIST. Kiūshiū, Shikoku (Thomas).

23. *Crocidura dsi-nezumi chisai* Thos.

Crocidura dsi-nezumi chisai, Thomas, P. Z. S., 1905, ii, p. 340.

DIST. Hondō (Thomas).

24. ?*Crocidura dsi-nezumi umbrina* (Temm.).

Sorex umbrinus, Temminck, Fauna Japonica, Mamm., p. 27 (1844).

?*Crocidura dsi-nezumi umbrina*, Thomas, P. Z. S., 1905, ii, p. 361.

DIST. Yaku-shima (Thomas).

25. *Crocidura murina*¹ (Linn.).

Sorex murinus, Linnæus, S. N., (12), p. 74 (1766); Swinhoe, P. Z. S., 1870, p. 620.

1) Other synonyms of *Crocidura murina* are as follows (Blanford);—

Sorex myosurus Pallas, 1785; *Sorex serpentarius* Geoffroy; *Sorex nemorivagus et soccatus* Hodgson, 1845; *Sorex griffithii et niger* Horsfield; *Sorex kandianus, montanus et ferrugineus* Kelaart; *Sorex saturator* Hodgson, 1855; *Sorex heterodon* Blyth; *Sorex albinus* Blyth; *Sorex tytleri* Jerdon; *Crocidura* (*Pachyura*) *blythii, pealiana et blanfordii* Anderson.

Crocidura murina, Blanford, Fauna Brit. Ind., Mamm., p. 233 (1888-91); Flower, P. Z. S., 1900, 337.

NOM. ANG. Musk rat or Brown musk shrew.

DIST. India, Ceylon, Burma (Blanford); Formosa (Swinhoe).

Gen. *Chimarrogale* Anderson.

Chimarrogale, Anderson, J. A. S. B., xlv, p. 262 (1877); Dobson, *ibid.*, 1890, p. 50; Blanford, Fauna Brit. Ind., Mamm., p. 245 (1888-91).

26. *Chimarrogale platycephala* (Temm.).

Sorex platycephala, Temminck, Fauna Japonica, Mamm., p. 23 (1842).

Chimarrogale platycephala, Thomas, P. Z. S., 1905, ii, p. 340.

NOM. JAP. Kawa-nezumi.

DIST. S. E. Hondō (Thomas); Kiūshiū (Temminck).

Fam. ERINACEIDÆ.

Gen. *Erinaceus* Linn.

Erinaceus, Linnæus, S. N., (10), p. 75 (1758); Blanford, Fauna Brit. Ind., Mamm., p. 213 (1888-91).

27. *Erinaceus* sp.

Erinaceus sp. Swinhoe, P. Z. S., 1870, p. 621.

DIST. Formosa (Swinhoe).

Ord. CHIROPTERA.

Sub-Ord. MEGACHIROPTERA.

Fam. PTEROPODIDÆ.

Sub-Fam. Pteropodinae.

Gen. *Pteropus*¹ Briss.

Pteropus, Brisson, Regn. Anim. in classes ix distrib., 2 ed., p. 13; Geoffroy, Ann. du Mus., xv, p. 90 (1840); Dobson, Cat. Chiropt. Brit. Mus., p. 15 (1878) (pars included *Acerodon* et *Styloctenium*); Matschie, Flederm. des Berliner Mus. für Naturk., 1899, p. 5 (pars included *Pteralopex* et *Acerodon*); Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 56 (1907).

Spectrum Lacépède, Tabl. des div. Sousdiv., Orders et Genres des Mammif., 1799, p. 15; Matschie, Flederm. des Berliner Mus. für Naturk., 1899, p. 19.

28. *Pteropus dasymallus* Temm.

Pteropus dasymallus, Temminck, Monogr. Mamm., i, p. 180, pl. 10 (1827); Peters, MB. Ak. Berl., 1867, p. 323; Dobson, Monogr. Asiat. Chiropt. Ind. Mus., p. 16 (1876); Bangs, Amer. Nat., xxxv, no. 415, p. 561 (1901).

Spectrum dasymallum, Gray, Cat. monkeys and fruit-eating bats, p. 101 (1870).

NOM. JAP. Yaku-kōmori.

DIST. Liūkiū (Bangs).

29. *Pteropus formosus* Sclater.

Pteropus formosus, Sclater, P. Z. S., 1873, p. 193, pl. 22.

1) Other synonyms of Gen. *Pteropus* are as follows (G. S. Miller):—

Eumycteris Gray, 1866; *Pselaphon* Gray, 1870; *Sericomycteris* Matschie, 1899; *Eumycteris* (Subgen.) Matschie, 1899.

DIST. Formosa (Sclater).

30. *Pteropus loochooensis* Gray.

Pteropus loochooensis, Gray, Cat. monkeys and fruit-eating bats, p. 106 (1870).

Pteropus keraudreni loochooensis, Bonhote, Novit. Zool., ix, no. 3, p. 628 (1902).

NOM. JAP. Okinawa-kōmori.

DIST. Liūkiū (Bonhote).

31. *Pteropus pselaphon* Lay.

Pteropus pselaphen, Lay, Zool. Journ., iv, p. 457; Temminck, Fauna Japonica, Mamm., p. 13 (1842).

NOM. JAP. Ogasawara-kōmori.

DIST. Bonin Islands (Temminck).

Sub-Ord. MICROCHIROPTERA.

Fam. RHINOLOPHIDÆ.

Gen. *Rhinolophus*¹ Lacépède.

Rhinolophus, Lacépède, Tabl. des div. sousdiv., orders et genres des Mammif., p. 15 (1799); Dobson, Monogr. Chiropt. Ind. Mus., p. 37 (1876); *ibid.*, Cat. Chiropt. Brit. Mus., p. 100 (1878); Geoffroy, Nouv. dict. d'hist. nat., xix, p. 383 (1803); Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 108 (1907).

32. *Rhinolophus cornutus cornutus* Temm.

Rhinolophus cornutus, Temminck, Monogr. Mamm., ii, p. 37 (1835—41); *ibid.*, Fauna Japonica, p. 14, pl. 2 (1842); Peters, MB. Ak.

¹ Other synonyms of Gen. *Rhinolophus* are as follows (G. S. Miller):—

Rhinocephis Gervais, 1836; *Aquias* Gray, 1847; *Phyllotis* Gray, 1866 (nec *Phyllotis* Waterhouse, 1837); *Cætophyllus* Gray, 1866; *Euryalus* Matschie, 1901.

Berl., 1871, p. 309; Andersen, P. Z. S., 1905, ii, p. 128; Thomas, *ibid.*, 1907, p. 406; *ibid.*, 1908, p. 49.

Rhinolophus minor (pars, nec Horsfield), Dobson, Cat. Chiropt. Brit. Mus., p. 114 (1878); *ibid.*, Monogr. Chiropt. Ind. Mus., p. 50 (1876).

NOM. JAP. Kokikugashira-kōmori.

DIST. Japan proper (Andersen).

33. *Rhinolophus cornutus pumilis* Andersen.

Rhinolophus minor (nec Horsfield), Bonhote, Nov. Zool., ix, no. 3, p. 626 (1902).

Rhinolophus cornutus pumilis, Andersen, P. Z. S., 1905, ii, p. 127.

DIST. Liūkiū, China: Foo-chow (Andersen).

34. *Rhinolophus ferrum-equinum nippon* Temm.

Rhinolophus nippon, Temminck, Monogr. Mamm., ii, p. 30 (1835—41); *ibid.*, Fauna Japonica, p. 14 (1842); Peters, MB. Ak., Berl., 1871, p. 312.

Rhinolophus ferrum-equinum (pars), Dobson, Cat. Chiropt. Brit. Mus., p. 119 (1878); Namiye, Zool. Mag., Tokyo, i, p. 172 (1889).

Rhinolophus ferrum-equinum nippon, Andersen, P. Z. S., 1905, ii, p. 110; Thomas, *ibid.*, 1908, p. 637.

NOM. JAP. Kikugashira-kōmori.

DIST. Japan proper, Korea, S. China: Shanghai (Andersen).

35. *Rhinolophus monoceros* Andersen.

Rhinolophus monoceros, Andersen, P. Z. S., 1905, ii, p. 131; Linde, Ann. Mag. N. H., (8), ii, p. 237 (1908).

DIST. Formosa: Kagi, Takao (Andersen).

Fam. HIPPOSIDERIDÆ.

Gen. *Hipposideros*¹ Gray.

Hipposideros, Gray, Zool. Misc., 1831, p. 37; *ibid.*, P. Z. S., 1834, p. 53; Blanford, P. Z. S., 1887, p. 637; Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 110 (1907).

Phyllorhina, Bonaparte, Icon. della Fauna Ital., xxi, (1837); Dobson, Cat. Chiropt. Brit. Mus., p. 127 (1878); *ibid.*, Monogr. Chiropt. Ind. Mus., p. 58 (1876).

36. *Hipposideros bicolor fulvus* Gray.

Hipposideros fulvus et *murinus*, Gray, Mag. Zool. and Bot., ii, p. 492 (1838).

Rhinolophus murinus et *fulvus*, Elliot, Cat. Mamm. South Mahratta Country, p. 8 (1840).

Hipposideros fulvus, *murinus* et *atratus*, Kelaart, Prodr. Fauna Zeylan., pp. 15, 16 (1852).

Phyllorhina aurita, Tomes, P. Z. S., 1859, p. 76; Swinhoe, *ibid.*, 1870, p. 616.

Chrysonycteris fulva, Gray, P. Z. S., 1866, p. 82.

Phyllorhina fulva, Peters, MB. Ak. Berl., 1871, p. 322; Dobson, P. A. S. B., 1872, p. 155.

Phyllorhina bicolor subsp. *fulva*, Dobson, Mongr. Chiropt. Ind. Mus., p. 71, (1876).

NOM. ANG. Large-eared leaf-nose.

1) Other synonyms of Gen. *Hipposideros* are as follows (G. S. Miller):—

Macronycteris Gray, 1866; *Gloionycteris* Gray, 1866; *Speorifera* Gray, 1866; *Rhinophylla* Gray, 1866 (nec *Rhinophylla* Peters, 1865); *Chrysonycteris* Gray, 1866; *Doryrhina* Peters, 1871 (Subgen. of *Phyllorhina*); *Sideroderma* Peters, 1871 (Subgen. of *Phyllorhina*); *Ptychorhina*, Peters, 1871 (Subgen. of *Phyllorhina*); *Cyclorina* Peters, 1871 (Subgen. of *Phyllorhina*); *Thyrcorhina*, Peters, 1871 (Subgen. of *Phyllorhina*); *Syndesmotis* Peters, 1871 (Subgen. of *Phyllorhina*).

DIST. India, Ceylon, Burma, China: Amoy (Dobson); Formosa (Swinhoe).

37. *Hipposideros turpis* Bangs.

Hipposideros turpis, Bangs, Amer. Nat., xxxv, no. 415, p. 561 (1901); Andersen, Ann. Nag. N. H., (7), xvii, p. 38 (1906).

DIST. Liūkiū: Ishigaki I. (Bangs).

Fam. VESPERTILIONIDÆ.

Sub-Fam. Vespertilioninæ.

Gen. *Myotis*¹ Kaup.

Myotis, Kaup, Skizzirte Entw.—gesch. u. Natürl. Syst. d. europ. Thierw., 1, p. 106 (1829); Miller, Ann. Mag. N. H., (6), xx, p. 382. (1897); *ibid.*, N. Amer. Fauna, no. 13, p. 55, (1897); *ibid.*, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 200 (1907).

Leuconœ, Boie, Isis, p. 256 (1830).

Vespertilio, Keyserling et Blasius, Wieg. Archiv, 1839, p. 306 (nec Linn. 1758); Dobson, Cat. Chiropt. Brit. Mus., p. 284 (1878) (nec Linn. 1758); Allen, Monogr. Bats N. Amer., p. 70 (1893) 1894.

38. *Myotis macrodactylus*² (Temm.).

Vespertilio macrodactylus, Temminck, Monogr. Mamm., ii, p. 231 (1835—41); *ibid.*, Fauna Japonica, Mamm., p. 16 (1842).

1) Other Synonyms of Gen. *Myotis* are as follows (G. S. Miller):—

Nystactes Kaup, 1829 (nec *Nystactes* Gloger, 1829); *Selysius* Bonaparte, 1841; *Capaccinius* Bonaparte, 1841; *Trilatitus* Gray, 1842; *Tralatitus* Gervais, 1849; *Brachyotus* Kolenati, 1856 (Nec *Brachyotus* Gould, 1837); *Isotus* Kolenati, 1856; *Pternopterus* Peters, 1867; *Exochurus* Fitzinger, 1870 (Nec *Exochura* Kolenati, 1858); *Aeorestes* Fitzinger, 1870; *Comastes* Fitzinger, 1870.

2) Held by Dobson to be synonymous with *capaccinii*, but the two held by Thomas as distinct species (see P. Z. S., 1905, ii, p. 337).

Vespertilio capaccinii, Namiye, Zool. Mag. Tokyo, i, p. 288 (1889).

Myotis (Leuconax) macrodactylus, Thomas, P. Z. S., 1905, ii, p. 337.

NOM. JAP. Momoziro-kōmori.

DIST. Kiūshiū (Thomas), Hondō (Namiye).

39. *Myotis mystacinus* (Leisl.).

Vespertilio mystacinus, Leisl., Kuhl, Deutsch. Flederm., Ann. Wetterau. Naturk., iv, p. 55 (1819); Desmarest, Mamm., p. 40 (1820); Bell, Brit. Quadrup., p. 50 (1837); MacGillivray, Brit. Quadrup. (Nat. Libr.), pp. 63, 90 (1838); Temminck, Monogr. Mamm., ii, p. 191 (1835—41); Keyserling et Blasius, Wiegmann Archiv, 1839, p. 310; Wagner, Suppl. Schreb. Säugeth., v, p. 725 (1855); Blasius, Fauna Deutschl., p. 96 (1857); Dobson, Monogr. Chiropt. Ind. Mus., p. 133 (1876).

Vespertilio siligorensis, Horsfield, Ann. Mag. N. H., 1853, p. 102.

Myotis mystacinus, Thomas, P. S. Z., 1907, p. 407.

DIST. Himalayas-Nipal, from Russia to Ireland and from Alps to Finland (Dobson); Saghalien (Thomas); Kuril Islands.

40. *Myotis nattereri bombinus* Thos.

Myotis nattereri bombinus, Thomas, P. Z. S., 1905, ii, p. 337.

DIST. Kiūshiū (Thomas).

41. *Myotis taiwanensis* Linde.

Myotis taiwanensis, Linde, Ann. Mag. N. H., (8), ii, p. 235 (1908).

DIST. Formosa: Takao, Anping and Tainan (Linde).

Gen. *Plecotus* Geoff.

Plecotus, Geoffroy, Descr. de l'Égypte, ii, p. 112 (1812); Dobson, Cat. Chiropt. Brit. Mus., 1878, p. 117 (pars); ibid. Monogr. Chiropt.

Ind. Mus., p. 83 (1876); Blanford, Fauna Brit. Ind. Mamm., p. 297 (1888—91); Miller, Smith, Inst. U. S. Nat. Mus. Bull. 57, p. 224 (1907).

Macrotus, Leach, Cat. Spec. Indig. Mamm. and Birds, Brit. Mus. (Willughby Society reprint, 1882), p. 1 (1816).

42. *Plecotus auritus* (Linn.).

Vespertilio auritus, Linnæus, S. N., p. 32 (1758); Schreber, Säugeth., p. 163 (1775); Geoffroy, Ann. du Mus., viii, p. 197 (1806); Desmarest, Mamm., p. 144 (1820).

Plecotus auritus, Geoffroy, Descr. de l'Egypte, ii, p. 118 (1812); Keyserling et Blasius, Wiegmann Archiv, 1839, p. 306; Blasius, Fauna Deutschl., pl. 39, p. 37 (1857); Schrenck, Amur Land, Mamm., p. 115 (1859); Kinahan, Proc. Nat. Hist. Soc. Dublin, ii, p. 154 (1859); Dobson, Monogr. Chiropt. Ind. Mus., p. 84 (1876); Blanford, Fauna Brit. Ind. Mamm., p. 297 (1888—91); Namiye, Zool. Mag., Tokyo, i, p. 510 (1889); Thomas, P. Z. S., 1907, p. 406; *ibid.*, 1911, p. 131.

NOM. JAP. Usagi-kōmori.

DIST. The Palæarctic region, extending from Ireland through Europe and North Africa to the Himalayas, and probably generally distributed throughout the temperate parts of Asia (Dobson); Japan: Hondō, Hokkaidō and Kuril Islands.

Gen. *Barbastella* Gray.

Barbastella, Gray, London medical repository, xv, p. 300, (1821); Miller, Ann. Mag. N. H., (6), xx, p. 385 (1897); *ibid.*, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 223 (1907).

1) Other Synonyms of *Plecotus auritus* are as follows:—

Vespertilio otus Boie, 1825; *Vespertilio cornutus* Faber, 1826; *Vespertilio brevimanus* Jenyns, 1828; *Plecotus aegyptiacus* Geoffroy; *Plecotus peronii* Geoffroy; *Plecotus christii* Gray, 1838; *Plecotus bairdii* Gray 1838 (Dobson). *Plecotus homochrous* Hodgson; *Plecotus auritus* var. *brevimanus* Severtzoff, 1876; *Plecotus leucophæus* Severtzoff, 1876.

Synotus, Keyserling et Blasius, Wiegmann Archiv, 1839, p. 305; Blanford, Fauna, Brit. Ind. Mamm., p. 298 (1888-91); Dobson, Monogr. Chiropt. Ind. Mus., p. 85, (1876); *ibid.*, Cat. Chiropt. Brit. Mus., p. 175, (1878).

43. *Barbastella darjelingensis* Hodgs.

Barbastella darjelingensis, Hodgson, Ann. Mag. N. H., (2), xvi, p. 103 (1855); Thomas, P. Z. S., 1911, p. 160.

Barbastella darjelinensis, Dobson, P. A. S. B., 1875, p. 85.

Barbastellus communis, Blyth, J. A. S. B., xxi, p. 360; *ibid.*, xxiv, p. 363; *ibid.*, Cat., p. 36; Jerdon, Mamm., p. 48; Hutton, P. Z. S., 1872, p. 703; Dobson, J. A. S. B., xliii, pl. 2, p. 236 (nec Gray).

Synotus dargelinensis, Dobson, Monogr. Chiropt. Ind. Mus., p. 86 (1876).

Synotus darjelingensis, Blanford, Fauna Brit. Ind. Mamm., p. 298 (1888-91); Namiye, Zool. Mag. Tokyo, i, p. 418 (1889).

NOM. JAP. Chichibu-kōmori. NOM. ANG. Eastern barbastelle.

DIST. Himalayas, Assam, E. Turkestan, (Blanford); Yarkand (Dobson); W. China (Thomas); Japan: Hondō (Namiye).

Gen. *Nyctalus* Bowdich.

Nyctalus, Bowdich, Excursions in Madeira and Porto Sento during the Autumn of 1823, while on his third voyage to Africa, p. 36, (1825); Andersen, Ann. Mag. N. H., (8), i, p. 434 (1908); Thomas, *ibid.*, (8), viii, p. 379 (1911).

Pterygistes, Kaup, Skizzirte Entw.-gesch. u. Natürl. Syst. der europ. Thierw. i, p. 99 (1829); Miller, Ann. Mag. N. H., (6), xx, p. 384 (1897); *Ibid.*, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 207 (1907).

Vesperugo, Keyserling et Blasius, Wiegmann Archiv, 1839, p. 312 (pars); Dobson, Cat. Chiropt. Brit. Mus., p. 183, (1878) (pars).

Noctulina, Gray, Ann. Mag. N. H. 1842, x, p. 258 (pars); Allen, P. U. S. Nat. Mus., 1893, p. 30.

Panugo, Kolenati, Allgem. Deutsch. Naturhist, Zeitung, Dresden neue Forge, ii, p. 131.

44. *Nyctalus aviator* Thos.

Vespertilio molossus, Temminck, Monogr. Mamm., ii, p. 269 (1835—41); *ibid.*, Fauna Japonica, Mamm., p. 15 (1842); Wagner, Supp. Schreb. Säugeth., v. p. 738 (1855); Peters, MB. Ak. Berl., 1863, p. 639.

Vespertilio noctula subsp. a *molossus*, Dobson, Monogr. Chiropt. Ind. Mus., p. 90 (1876).

Vespertilio noctula var. *lasiopterus*, Namiye, Zool. Mag., Tokyo, i, p. 212 (1889).

Nyctalus aviator, Thomas, Ann. Mag. N. H., (8), viii, p. 380 (1911).

NOM. JAP. Yama-kōmori. NOM. ANG. Large Japanese noctule.

DIST. Korea (Miller); China, Japan (Dobson).

45. *Nyctalus noctula*¹ (Schreb.).

Vespertilio noctula, Schreber, Säugeth., i, p. 166, pl. 52 (1775); Gmelin, Linnæus, S. N., (13), i, p. 146 (1788); Desmarest, Mamm., 1820, p. 136; Temminck, Monogr. Mamm., ii, p. 169 (1835—41); Jenyns, Brit. Vertebr., p. 23; Bangs, Icon. della Fauna Ital. xxi, (1837); Bell; Brit. Quadrup., p. 12, (1837); De Selys-Longch, Faune Belge. 1842, Temminck, Fauna Japonica, Mamm., p. 15 (1842).

Scotophilus noctula, Gray, Mag. Zool. and Bot., ii, p. 497 (1838),

Vesperugo noctula, Keyserling et Blasius, Wiegmann Archiv, 1839, p. 317; *ibid.*, Wirbelth. Europ., p. 46; Wagner, Supp. Schreb. Säugeth., v. p. 728 (1855); Blasius, Fauna Deutschl. pp. 53, 54 (1857); Blanford, Fauna Brit. Ind. Mamm., p. 308 (1888—91); Namiye, Zool. Mag., Tokyo, i, p. 256 (1889).

1) Other synonyms of *Nyctalus noctula* are as follows (Dobson):—

Vespertilio magnus Berkenhout, 1789; *Vespertilio altivolans* White, 1789; *Vespertilio serotinus* Geoffroy, 1806; *Vespertilio proterus* Kuhl, 1817; *Vespertilio labiata* Hodgson, 1835; *Vespertilio macuanus* Peters, 1852.

Noctulina noctula, Jerdon, Mamm., p. 36 (1867).

NOM. JAP. Kōmori. NOM. ANG. Noctule bat.

DIST Palæarctic, Ethiopian and Oriental Regions, extending from England to Japan, and from the Scandinavian Peninsula to Southern Africa. In Europe generally distributed; in Asia extending from Western Turkestan along the Himalayas and other mountain range to Ceylon, and through the Malay Peninsula to Sumatra and Java, in Africa recorded from the northern parts, and from Mozambique (Dobson).

Gen. *Pipistrellus*¹ Kaup.

Pipistrellus, Kaup, Skizzirte Entw.-gesch. u. Natürl. Syst. d. europ. Thierw., i, p. 98 (1829); Bonaparte, Icon della Fauna Ital., xx (1837); Dobson, P. A. S. B., 1871, p. 213; Miller, Ann. Mag. N. H., (6), xx, p. 384 (1897); *ibid.*, N. Amer. Fauna, no. 13, p. 87 (1897); *ibid.*, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 204 (1907).

Vesperugo, Keyserling et Blasius, Wiegmann Archiv, v, 1, p. 312 (pars); Dobson, Cat. Chiropt. Brit. Mus., 1878, p. 183 (pars); Allen, Monogr. Bats N. Amer., p. 121, (1893) 1894.

46. *Pipistrellus abramus*² (Temm.).

Vespertilio abramus, Temminck, Monogr. Mamm., ii, p. 216 (1835—41); Wagner, Supp. Schreb. Säugeth., v, p. 738 (1855); Linde, Ann. Mag. N. H., (8), ii, p. 236 (1908).

1) Other synonyms of Gen. *Pipistrellus* are as follows (G. S. Miller):—

Romicia Gray, 1838; *Romicus* Blyth, 1840; *Hypsugo* Kelenati, 1856; *Nannugo* Kolenati, 1856; *Scotophilus* Allen, 1864.

2) Other synonyms of *Pipistrellus abramus* are as follows (Dobson):—

Vespertilio imbricatus Temminck, 1835—41; *Scotophilus javanicus* Gray, 1838; *Scotophilus coromandra* Gray, 1838; *Vespertilio coromandelicus* Blyth, 1855; *Vesperugo blythii* Wagner, 1855; *Scotophilus coromandelicus* Horsfield, 1855; *Vespertilio coromandelicus* Tomes, 1858; *Pipistrellus coromandelicus* Dobson, 1871; *Vesperugo imbricatus* Peters 1872.

Vespertilio akokomuli, Temminck, Fauna Japonica, Mamm., p. 17 (1842); Thomas, P. Z. S., 1905, ii, p. 337.

Vesperugo abramus, Temminck, Funna Japonica, Mamm., p. 17 (1842); Dobson, Monogr. Chiropt. Ind. Mus., p. 97 (1876); *ibid.*, Cat. Chiropt. Brit. Mus., p. 226 (1878); Scully, J. A. S. B., lvi, pt. 2, p. 250; Blanford, *ibid.*, lvii, pt. 2, p. 266; Swinhoe, P. Z. S., 1870, p. 227; Anderson, Cat. Mamm. Ind. Mus., i, p. 129 (1881); Namiye, Zool. Mag., Tokyo, i, p. 124 (1889); Blanford, Fauna Brit. Ind. Mamm., p. 313 (1888-91); Thomas, P. Z. S., 1898, p. 771; Flower, *ibid.*, 1900, p. 345.

Pipistrellus abramus, Thomas, P. Z. S., 1905, ii, p. 337.

NOM. JAP. Aburamushi. NOM. ANG. Indian pipistrelle.

DIST. Europe, India, Ceylon, Burma, Cambodia, China, Japan, Malay Peninsula (Penang and Singapore), Philippines, Celebes, New Guinea, N. Australia (Flower).

47. *Pipistrellus pipistrellus*¹ (Schreb.).

Vesperugo pipistrellus, Schreber, Säugeth., i, p. 167, pl. 54 (1775); Erxleben, Syst. Règne Anim., p. 148 (1777); Geoffroy, Descr. de l'Égypte, ii, p. 116 (1812); Kuhl, Wetter. Ann., iv, p. 53 (1817); Desmarest, Mamm., p. 139 (1820); Jenyns, Trans. Linn. Soc., xvi, p. 163; Bell, Brit. Quadrup., p. 31 (1837); Bonaparte, Icon della Fauna Ital.; Temminck, Monogr. Mamm., ii, p. 194, pl. 48 (1835-41); Keyserling et Blasius, Wieg. Archiv, 1839, p. 321; *ibid.*, Wirberth. Europ., p. 49 (1840); Blasius, Fauna Deutschl. p. 61 (1857); Wagner, Supp. Schreb. Säugeth., v, p. 730 (1855); Dobson, Monogr. Chiropt. Ind. Mus., p. 96 (1876); Swinhoe, P. Z. S., p. 618 (1870); Wallace, Island life, p. 394 (1902).

NON. ANG. Small house-bat.

DIST. The temperate region of Asia north of Himalayas, and

1) Other synonyms of *Pipistrellus pipistrellus* are as follows (Dobson):—
Scotophilus murinus Gray, 1838; *Vespertilio brachyotus* Temminck, 1840.

generally distributed throughout Europe and its islands (Dobson); Japan (Wallace); ?Formosa (Swinhoe).

Gen. *Vespertilio*¹ Linn.

Vespertilio, Linnæus, S. N., (10), p. 31 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 328 (1888—91); Miller, Ann. Mag. N. H., (6), xx, p. 384 (1897) (pars); *ibid.*, N. Amer. Fauna, no. 13, p. 95 (1897) (pars); Méhely, Monogr. Chiropt. Hungariæ, p. 219 (pars); Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 209 (1907).

Vesperugo, Keyserling et Blasius, Wiegmann Archiv, 1839, p. 312 (pars); Dobson, Cat. Chiropt. Brit. Mus., 1878, p. 183 (pars).

48. *Vespertilio formosus* Hodgs.

Vespertilio formosus, Hodgson, J. A. S. B., iv, p. 700 (1835); Dobson, Cat. Chiropt. Brit. Mus., p. 311 (1878); Anderson, Cat. Mamm. Ind. Mus., i, p. 142 (1881).

DIST. Himalayas: Nipal, Darjeeling; India: Cháibásá, Khási Hills; China: Shanghai, Kiang, Amoy; Formosa (Dobson).

49. *Vespertilio murinus superans* Thos.

Vespertilio murinus sperans, Thomas, P. Z. S., 1898, p. 770; *ibid.*, 1908, i, p. 52.

Vespertilio discolor superans, Winton, P. Z. S., 1899, p. 573.

DIST. China: Se-salin, Ichang, Yan-tse-kiang; Japan: Hondō (Thomas).

50. *Vespertilio rufo-niger* Tomes.

Vespertilio rufo-niger, Tomes, P. Z. S., 1858, p. 85; Swinhoe, *ibid.*, 1870, p. 167.

1) Other synonyms of Gen. *Vespertilio* are as follows (G. S. Miller):—

Eptesicus Rafinesque, 1820; *Cnephaus* Kaup., 1829; *Vesperus* Keyserling et Blasius, 1839 (Subgen. of *Vesperugo*, pars); *Meteorus* Kolenati, 1856 (pars); *Aristippe* Kolenati, 1863 (pars); *Marsipolamus* Peters, 1872 (Subgen. of *Vesperugo*); *Vesperus* Dobson, 1878 (Subgen. of *Vesperugo*, pars); *Adelomycteris* Allen, 1891.

NOM. ANG. Black and orange bat.

DIST. Formosa (Swinhoe).

Sub-Fam. *Miniopterinae*.

Gen. *Miniopterus*¹ Bonap.

Miniopterus, Bonaparte, Icon. della Fauna Ital., xx. (Subgen. of *Vespertilio*); Dobson, Cat. Chiropt. Brit. Mus., p. 347 (1878); Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 227 (1907).

51. *Miniopterus fuscus* Bonh.

Miniopterus fuscus, Bonhote, Novit. Zool., ix, no. 3, p. 626 (1902); Thomas, P. Z. S., 1905, ii, p. 338.

DIST. Liūkiū (Bonhote).

52. *Miniopterus schreibersi japoniae* Thos.

Vespertilio blepotis, Temminck, Fauna Japonica, Mamm., p. 16, (1842).

Miniopterus schreibersii, Namiye, Zool. Mag., Tokyo, i, p. 338, (1889); *ibid.*, xxi, p. 453 (1909).

Miniopterus schreibersi japoniae, Thomas, P. Z. S., 1905, ii, p. 338; Linde, Ann. Mag. N. H., (8), ii, p. 237 (1908).

NOM. JAP. Yubinaga-kōmori.

DIST. Hondō (Namiye); Kiūshiū (Thomas); Liūkiū (Namiye); Formosa: Tainan (Linde); Java (Temminck).

Sub-Fam. *Murinae*.

Gen. *Murina* Gray.

Murina, Gray, Ann. Mag. N. H., 1842, x, p. 258; Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 229 (1907).

¹) Other synonyms of Gen. *Miniopterus* are as follows (G. S. Miller):—

Miniopterus Gray, 1866; *Minyopterus* Winge, 1892; *Minneopterus* Lampe, 1900

Herpiocephalus, Gray, Ann. Mag. N. H., 1842, x, p. 259; *ibid.*, (3) xvii p. 90 (1866); Dobson, Cat. Chiropt. Brit. Mus., 1878 p. 276 (pars, Subgen. *Murina*, p. 277, and Subgen. *Harpiocephalus*, p. 277); *ibid.*, Monogr. Chiropt. Ind. Mus., 1876, p. 150 (pars).

Ocyptes, Lesson, Nouv. Tabl. Règne Anim., p. 30 (pars, nec *Ocyptes* Wagler, 1832).

53. *Murina hilgendorfi* (Peters).

Herpiocephalus hilgendorfi, Peters, MB. Ak. Berl., 1880, p. 23; Namiye, Zool. Mag., Tokyo, i, p. 201 (1889).

Murina hilgendorfi, Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 230 (1907).

NOM. JAP. Tengu-kōmori.

DIST. Hondō (Namiye).

Fam. MOLOSSIDÆ.

Gen. *Nyctinomus*¹ Geoff.

Nyctinomus, Geoffroy, Descr. de l'Égypte, ii, p. 114 (1812); Dobson, Cat. Chiropt. Brit. Mus., 1878, p. 420 (pars); Miller, Smith. Inst. U. S. Nat. Mus. Bull. 57, p. 251 (1907).

54. *Nyctinomus cestonii*² (Savi).

Dinops cestonii, Savi, Nouv. Giorn. di Lett., p. 230 (1825); Bullet., des Sci. Nat., viii, p. 286; Temminck, Monogr. Mamm., i, p. 262 (1827); Keyserling et Blasius, Wieg. Archiv, 1839, p. 305.

Disopes (Molossus) rüppelii, Temminck, Monogr. Mamm., i, pl. xviii (1827); *ibid.*, ii, p. 224 (1835—41); Swinhoe, P. Z. S., 1870, p. 619.

Nyctinomus cestonii, Dobson, J. A. S. B., 1874, p. 142; *ibid.*, Monogr.

1) Other synonyms of Gen. *Nyctinomus* are as follows (G. S. Miller):—*Nyctinomes* Gray, 1821; *Nyctinomia* Fleming, 1822; *Nyctinoma* Bowdich, 1827.

2) Other synonyms of *Nyctinomus cestonii* are as follows (Dobson):—*Dysopes cestonii* Wagner, 1855; *Nyctinomus insignis* Blyth, 1863.

Chiropt. Ind. Mus., p. 180 (1876); Wallace, Island life, p. 402 (1902).

NOM. ANG. Large-eared bat.

DIST. Europe: Madeira, Switzerland, Italy, Sicily, Greece; Africa: Egypt, Nubia, Asia: China (Amoy) (Dobson); Formosa (Wallace).

Ord. PHOLIDOTA.

Fam. MANIDÆ.

Gen. *Manis* Linn.

Manis, Linnæus, S. N., (10), p. 36 (1758); Blanford, Fauna, Brit. Ind. Mamm., p. 595 (1888—91).

55. *Manis pentadactyla* Linn.

Manis pentadactyla, Linnæus, S. N., (10), p. 36 (1758) (pars, nec Blanford, Fauna Brit. Ind. Mamm., 1888—91, p. 597); Cantor, Ann. Mag. N. H., 1842, ix, p. 275; Gray, Cat. Heds. Coll., 1st ed. p. 36; Blyth, J. A. S. B., xxiv, p. 93; Thomas, P. Z. S., 1911, p. 133.

Manis aurita, Hodgson, J. A. S. B., v, p. 234 (1836); Blyth, Cat., p. 179; Jerdon, Mamm., p. 316; Anderson, An. Zool. Res., p. 352, pl. xxiv, figs. 3. 4; Jentink, Notes Leyden Mus., iv, p. 202; Blanford, Fauna Brit. Ind. Mamm., p. 599 (1888—91); Sclater, Cat. Mamm. Ind. Mus., p. 330 (1891).

Manis brachyura, M'Clelland, P. Z. S., 1839, p. 183.

Manis dalmanni, Sundevall, Kongl. Vetens. Akad. Handl., p. 256, pl. iv, fig. 10 (1842); Swinhoe, P. Z. S., 1870, pp. 236, 650.

Manis javanica, Adams, P. Z. S., 1859, p. 133; Blyth, J. A. S. B., xi, p. 454; *ibid.*, xvi, p. 1274; *ibid.*, xxix, p. 449 (nec Desmarest).

Pholidotes dalmanni, Gray, Cat. Carn. Brit. Mus., p. 371 (1869).

Manis dalmani, Thomas, P. Z. S., 1911, p. 133.

NOM. JAP. Senzanko. NOM. ANG. Chinese pangolien.

DIST. The Himalayas from Nepal to Assam, Upper Burma at considerable elevations, Yunnan and southern China, including the Islands of Formosa and Hainan (Sclater).

Ord. RODENTIA.

Sub-Ord. DUPLICIDENTATA.

Fam. LEPORIDÆ.

Gen. *Lepus*¹ Linn.

Lepus, Linnæus, S. N., (10), p. 57 (1758); Gray, Ann. Mag. N. H., (3), xx, p. 222 (1867); Coues et Allen, Monogr. N. Amer. Rodent., p. 282 (1877); Blanford, Fauna Brit. Ind. Mamm., p. 448 (1888—91).

56. *Lepus brachyurus brachyurus* Temm.

Lepus brachyurus, Temminck, Fauna Japonica, Mamm., p. 44 (1845); Thomas, P. Z. S., 1905, ii, p. 357.

NOM. JAP. No-usagi. NOM. ANG. Japanese hare.

DIST. Hondō, Shikoku (Thomas).

57. *Lepus brachyurus angustidens* Hollister.

Lepus brachyurus angustidens, Hollister, Proc. Biol. Soc. Wash., xxv, p. 183 (1912).

DIST. Hondō: Tateyama mountain (Hollister).

58. *Lepus brachyurus okiensis* Thos.

Lepus brachyurus okiensis, Thomas, P. Z. S., 1905, ii, p. 359.

1) Other synonyms of Gen. *Lepus* are as follows (Coues et Allen):—

Caprolagus Blyth, 1845; *Hydrolagus* Gray, 1867; *Sylvilagus* Gray, 1867; *Eulagus* Gray, 1867; *Tapeti* Gray, 1867; *Cuniculus* Gray, 1867; *Oryctolagus* Lilljeborg, 1873.

DIST. Okishima (Thomas).

59. *Lepus formosus* Thos.

Lepus formosus, Thomas, Ann. Mag. N. H., (8), i, p. 449 (1908).

DIST. Formosa (Thomas).

60. [*Lepus sinensis*¹ Gray.]

Lepus sinensis, Gray, Hardwicker's Ill. Ind. Zool; Swinhoe, P. Z. S., 1862, p. 359; *ibid.*, 1870, p. 639.

NOM. ANG. Chinese hare.

DIST. Formosa, S. China (Swinhoe).

61. *Lepus timidus timidus*² Linn.

Lepus timidus, Linnæus, S. N., (10), p. 57 (1758); *ibid.*, Fauna Suec., 2nd. ed., 1761, p. 9 (nec *Lepus timidus* Gmel.); Erxleben, Syst. Règne Anim., 1777, p. 329; Thumberg, Beskr. pa Svenske Djr., 1798, p. 38; Retzius, Fauna Suec., i, p. 31 (1800); Lilijeborg, Kongl. Vetensk. Akad., i, Stockh. Handl., 1850 (1851), p. 21; *ibid.*, Fauna öfner Sveriges och Norges Rygradsdjur, 1873, p. 418; Holmgren, Skandin. Dägg., 1865, p. 280; Coues et Allen, Monogr. N. Amer. Rodent., p. 288 (1877); Barrett-Hamilton, P. Z. S., 1900, p. 88; Thomas, P. Z. S., 1907, p. 414.

1) O. Thomas says:—"It is, however, to be noticed that Consul Swinhoe recorded *Lepus sinensis* as a native of Formosa (P. Z. S., 1862, p. 359), and that the one adult skin (No. 62, 12, 24, 16) of his collection sent as from the island is certainly more like *sinensis* than *formosus*. Whether, however, both forms occur in Formosa, or whether this specimen has been wrongly labelled, are questions which can only be settled when the mammal fauna of the island is more completely known. But considering the uniformity among themselves of all the specimens, young and old, they are unquestionably from Formosa. I am inclined to think that the specimen referred to has been incorrectly labelled" (see Ann. Mag. N. H., (8), i, p. 450).

2) Other synonyms of *Lepus timidus* are as follows (Barrett-Hamilton):—

Lepus albus Brisson, 1756; *Lepus variabilis* Pallas, 1778; *Lepus borealis sylvaticus* Nilsson, 1829—1832 (nec Bechman, 1837); *Lepus canescens*, 1844; *Lepus borealis* Nilsson, 1847.

NOM. JAP. Echigo-usagi. NOM. ANG. Variable-hare.

DIST. S. Scandinavia, Scotland, Mountains of Europe (Barrett-Hamilton); N. European Russia, Siberia (Coues et Allen); Saghalien (Thomas); N. Hondō.

62 *Lepus timidus ainu* Barr.-Ham.

Lepus timidus ainu, Barrett-Hamilton, P. Z. S., 1900, p. 90; Thomas, *ibid.*, 1905, ii, p. 356.

DIST. Hokkaidō (Barret-Hamilton); Kuril Islands.

Gen. *Pentalagus* Lyon.

Pentalagus, Lyon, Smith. Misc. Coll., xlv, pp. 321—447 (1904).

63. *Pentalagus furnessi* (Stone).

Caprolagus furnessi, Stone, Proc. Acad. Nat. Sc. Philad., 1900, p. 460; Bonhote, Novit. Zool., ix, no. 3, p. 628 (1902).

Pentalagus furnessi, Thomas, P. Z. S., 1905, ii, p. 357.

NOM. JAP. Amami-nousagi. NOM. ANG. Liūkiū hare.

DIST. Amami-ōshima (Stone).

Sub-Ord. SIMPLICIDENTATA.

Per. SCIUROMORPHA.

Fam. SCIURIDÆ.

Sub-Fam. Sciurinae.

Gen. *Sciurus* Linn.

Sciurus, Linnæus, S. N., (10), p. 63 (1758); Gray, Ann. Mag. N. H., (3), xx, p. 271 (1867); Blanford, Fauna Brit. Ind. Mamm., p. 369 (1888—91).

Macroxus, Gray, Ann. Mag. N. H., (3), xx, pp. 271, 275 and 326 (1867).

64. *Sciurus castaneoventris* Gray.

Sciurus castaneoventris, Gray, Ann. Mag. N. H., 1842, x, p. 263; ibid., Cat. Mamm. Brit. Mus., p. 142 (1843); Blyth, J. A. S. B., xxix, p. 90; ibid., Cat. Mamm., no. 322, p. 102; Gray, Ann. Mag. N. H., (3), xx, p. 283 (1867); Swinhoe, P. Z. S., 1870, p. 231; ibid., p. 633; Bonhote, Ann. Mag. N. H., (7), vii, p. 163 (1901).

Sciurus erythraeus, Swinhoe, P. Z. S., 1862, p. 11.

NOM. JAP. Kuri-hara-risu. NOM. ANG. Chestnut-bellied squirrel.

DIST. Formosa, China: Kwantung, Fokien, Hainan (Swinhoe).

65. *Sciurus lis* Temm.

Sciurus lis, Temminck, Fauna Japonica, Mamm., p. 45 (1845); Thomas, P. Z. S., 1905, ii, p. 347.

NOM. JAP. Risu. NOM. ANG. Japanese squirrel.

DIST. Hondō, Shikoku, Kiūshiū (Thomas).

66. *Sciurus taiwanensis taiwanensis* Bonh.

Sciurus taiwanensis, Bonhote, Ann. Mag. N. H., (7), vii, p. 165 (1901).

DIST. S. Formosa (Bonhote).

67. *Sciurus taiwanensis centralis* Bonh.

Sciurus taiwanensis centralis, Bonhote, Ann. Mag. N. H., (7) vii, p. 166 (1901).

DIST. Central mountains of Formosa (Bonhote).

68. *Sciurus taiwanensis roberti* Bonh.

Sciurus taiwanensis roberti, Bonhote, Ann. Mag. N. H., (7), vii, p. 166 (1901).

DIST. N. W. Formosa (Bonhote).

69. *Sciurus vulgaris orientis* Thos.

Sciurus varius, Tomminck, Fauna Japonica, Mamm., p. 44 (1845).

Sciurus vulgaris orientis, Thomas, P. Z. S., 1905, ii, p. 345; *ibid.*, 1907, p. 411.

NOM. JAP. Yōroppa-risu.

DIST. Hokkaidō (Thomas).

70. *Sciurus vulgaris rupestris* Thos.]

Sciurus vulgaris rupestris, Thomas, P. Z. S., 1907, p. 410.

DIST. Saghalien (Thomas).

Gen. *Dremomys* Père Heude.

Dremomys, Père Heude, Mem. N. H. Empire Chinois, iv, pt. 2, p. 54 (1898).

Zetis, Thomas, Jour. Bombay, Nat. Hist. Soc., xviii, p. 244 (1908); Thomas, Ann. Mag. N. H., (8), ii, p. 136 (1908).

71. *Dremomys owstoni* (Thos.).

Zetis owstoni, Thomas, Jour. Bombay Nat. Hist. Soc., xviii, p. 244 (1908).

Dremomys owstoni, Thomas, Ann. Mag. N. H., (8), ii, p. 136 (1908).

NOM. JAP. Owston-risu. NOM. ANG. Owston's squirrel.

DIST. Formosa (Thomas).

Gen. *Eutamias* Trouessart.

Eutamias, Trouessart, Cat. Mamm. vivants et fossiles, rongurs, 1886, p. 86 (Subgen.); Merriam, Proc. Biol. Soc. Wash., xi, 1897, p. 189 (adopted as a full gen.).

72. *Eutamias asiaticus*¹ (Gmel.).

Sciurus striatus, Pallas, Nov. Glires, 1778, p. 378 (nec *Sciurus striatus* Linn.) ; Schrenck, Amur Land, Mamm., p. 124 (1859).

Sciurus striatus a *asiaticus*, Gmelin, Linn., S. N., (13), i, p. 150 (1788).

Myoxus lineatus, Siebold, Spic. Fauna Japonica, p. 13 (1824).

Sciurus uthensis, Pallas, Zool. Rosso Asiat., i, 1831, p. 189 (Melanistic); Wagner, Supp. Schreb. Säugeth., iii, 1843, p. 232 ; Middendorff, Sibirische Reise, ii, Pt. 2, 1853, p. 183, Schrenck, Amur Land, Mamm., p. 125 (1859).

Tamias pallasii, Baird, Ann. Rep. Smith. Inst., 1856 (1857), p. 55 ; ibid., Mamm. N. Amer., 1857, p. 295.

Tamias quadrivittatus var. *pallasii*, Allen, Proc. Boston Soc. Nat. Hist., xvi, 1874, p. 290 (pars).

Tamias asiaticus, Coues et Allen, Monogr. N. Amer. Radent., 1877, p. 793 (pars) ; ibid., Bull. Amer. Mus., Nat. Hist., iii, p. 71 (1891) ; ibid., xix p. 137 (1903) ; Thomas, P. Z. S., 1907, p. 411.

Tamias lineatus, Thomas, P. Z. S., 1907, p. 411.

Eutamias asiaticus lineatus, Thomas, P. Z. S., 1908, p. 968.

Eutamias asiaticus uthensis, Thomas, P. Z. S., 1908, p. 968.

NOM. JAP. Torafu-nezumi or Shima-risu. NOM. ANG. Chipmunk. DIST. Siberia (Allen) ; Saghalien, Hokkaidō (Thomas) ; Kuril Islands.

Gen. *Tamiops* Allen.

Tamiops, Allen, Bull. Amer. Mus. Nat. Hist., xxii, p. 475 (1906).

73. *Tamiops maclellandi formosanus* (Bonh.).

Sciurus maclellandi, Swinhoe, P. Z. S., 1870, pp. 232, 634.

1) The *lineatus* from Hokkaido and the *uthensis* from Saghalien are here taken to be identical with *Eutamias asiaticus*.

Sciurus macclellandi formosanus, Bonhote, Ann. Mag. N. H., (7), v, p. 52 (1900).

DIST. Hainan, Formosa (Bonhote).

Gen. *Petaurista* Link.

Petaurista, Link, Beytr. Nat., ii, p. 78 (1795).

Pteromys (Cuv. 1800), Blanford, Fauna Brit. Ind. Mamm., p. 360 (1888-91).

74. *Petaurista lena* Thos.

Petaurista lena, Thomas, Ann. Mag. N. H., (7), xx, p. 522 (1907);
ibid., P. Z. S., 1907, p. 467.

DIST. Central Formosa (Thomas).

75. *Petaurista leucogenys leucogenys* (Temm.).

Pteromys leucogenys, Temminck, Fauna Japonica, Mamm., p. 46 (1845).

Petaurista leucogenys, Thomas, P. Z. S., 1905, ii, p. 344.

Petaurista leucogenys tosæ Thomas, Ann. Mag. N. H., (7), xv,
p. 488 (1905).

NOM. JAP. Musasabi. NOM. ANG. Japanese large flying-squirrel.

DIST. Kiūshiū, Shikoku (Thomas).

76. *Petaurista leucogenys nikkonis* Thos.

Petaurista leucogenys nikkonis, Thomas, Ann. Mag. N. H., (7), xv,
p. 487 (1905).

DIST. Central mountainous region of Hondō : Nikkō (Thomas).

77. *Petaurista leucogenys oreas* Thos.

Petaurista leucogenys oreas, Thomas, Ann. Mag. N. H., (7), xv,
p. 487 (1905).

DIST. Southern peninsula of Hondō : Wakayama (Thomas).

78. *Petaurista nitidus* (Desmarest).

Sciurus petaurista, Pallas, Miscell. Zool., p. 56 (1766).

Pteromys nitidus, Desmarest, Dict. Hist. Nat., xxvii, p. 403 (1818); Gray, Hardwicker's Ill. Ind. Zool., ii, pl. xvii; Thomas, P. Z. S., 1886, p. 73; *ibid.*, 1889, p. 230; Sclater, Cat. Mamm. Ind. Mus., ii, p. 36 (1891).

Pteromys grandis, Swinhoe, P. Z. S., 1862, p. 358; *ibid.*, 1870, p. 634.

NOM. JAP. Ōaka-musasabi. NOM. ANG. Large-red flying-squirrel.

DIST. The Malay Peninsula from Klang in Selangore southwards, the islands of Sumatra, Java and Borneo, also Siam and Formosa (Sclater).

79. *Petaurista pectoralis* (Swinhoe).

Pteromys pectoralis, Swinhoe, P. Z. S., 1870, p. 634.

NOM. ANG. White-breasted flying squirrel.

DIST. Southern mountains of Formosa (Swinhoe).

Gen. *Sciuropterus* Cuv.

Sciuropterus, Cuvier, Ann. du Mus., x, p. 126 (1825); Blanford, Fauna Brit. Ind. Mamm., p. 366 (1888—91).

Sub-Gen. *Sciuropterus* Cuv.

Sciuropterus, Thomas, Ann. Mag. N. H., (8), i, p. 5 (1908).

80. *Sciuropterus momonga momonga* (Temm.).

Pteromys (Sciuropterus) momonga, Temminck, Fauna Japonica, Mamm., p. 47 (1845).

NOM. JAP. Momonga. NOM. ANG. Japanese small flying-squirrel.

DIST. This form of the species may prove to be an inhabitant of one of the southern islands (Thomas).

81. *Sciuropterus momonga amygdali* Thos.

Sciuropterus momonga amygdali, Thomas, P. Z. S., 1905, ii, p. 344.
DIST. Hondō (Thomas).

82. *Sciuropterus russicus athene* Thos.

?*Pteromys volans*, Schrenck, Amur Land, Mamm., 1859, p. 116
(nec *Mus volans* Linn.)

Sciuropterus russicus athene, Thomas, P. Z. S., 1907, p. 409.
DIST. Saghalien (Thomas).

Gen. *Belomys* Thos.

Belomys, Thomas, Ann. Mag. N. H., (8), i, p. 2 (1908).

83. *Belomys kaleënsis* (Swinhoe).

Sciuropterus kaleënsis, Swinhoe, P. Z. S., 1862, p. 359; *ibid.*, 1870,
p. 634.

NOM. ANG. Small Formosan flying squirrel.

DIST. Mountain-forests of N. Formosa (Swinhoe).

84. *Belomys pearsoni* (Gray).

Sciuropterus pearsoni, Gray, Ann. Mag. N. H., 1842, x, p. 263;
Thomas, P. Z. S., 1886, p. 60.

Sciuropterus villosus, Blyth, J. A. S. B., xvi, p. 866 (1847); *ibid.*,
Cat., p. 96; Jerdon, Mamm., p. 179.

Pteromys pearsonii, Anderson, Anat. Zool. Res. p. 293 (1878).

Sciuropterus pearsoni, Blanford, Fauna Brit. Ind. Mamm., p. 369
(1888—91).

NOM. ANG. Hairly-footed flying-squirrel.

DIST. Sikhim, Bhutan and the Eastern Himalayas, Assam,
Cachar, Manipur, and Yunnan; also, according to Anderson, Formosa
(Blanford).

Fam. **CASTORIDÆ**.Gen. *Castor* Linn.

Castor, Linnæus, S. N., (10), p. 58 (1758), Mearns, Smith, Inst. U. S. Nat. Mus. Bull. 56, p. 350 (1907).

85. *Castor fiber* Linn.

Castor fiber Linnæus, S. N., (10), p. 58 (1758); Schrenck, Amur Land, Mamm., p. 145 (1859); Sclater, Cat. Mamm. Ind. Mus., ii, p. 44 (1891); Thomas, P. Z. S., 1911, p. 146.

NOM. JAP. Kairi. NOM. ANG. European beaver.

DIST. Amur region, Saghalien (Schrenck).

Per. **MYOMORPHA**.Fam. **GLIRIDÆ**.Gen. *Glirulus* Thos.

Glirulus, Thomas, P. Z. S., 1905, ii, p. 347.

86. *Glirulus japonicus* (Schinz).

Myoxus javanicus, Schinz, Synop. Mamm., 1845.

Myoxus elegans, Temminck, Fauna Japonica, Mamm., p. 52 (1845).

Myoxus lasiotus, Thomas, P. Z. S., 1880, p. 41.

Glirulus japonicus, Thomas, P. Z. S., 1905, ii, p. 347.

NOM. JAP. Yamane. NOM. ANG. Japanese dormouse.

DIST. Hondō, Shikoku (Thomas).

Fam. **MURIDÆ.**Sub-Fam. **Microtinæ.**Gen. ***Microtus*** Schrank.

Microtus, Schrank, Fauna Boica, i, p. 66 (1789); Blanford, Fauna Brit. Ind. Mamm., p. 429 (1888—91); Mearns, Smith, Inst. U. S. Nat. Mus. Bull. 56, p. 498 (1907).

Arvicola, Lacépède, Tableau, 1803, p. 10; Coues et Allen, Monogr. N. Amer. Rodent. p. 147 (1877).

Hypudæus, Illiger, Prodr. 1811, not of Keyserling et Blasius, nor of Baird, including *Mus lemmus*, *amphibius* and *avalis*.

Sub-Gen. ***Microtus*** Schrank.

Microtus, Miller, N. Amer. Fauna, 1896, p. 63; Mearns, Smith, Inst. U. S. Nat. Mus. Bull. 56, p. 498 (1907).

87. *Microtus montebelli* (M.-Edw.).

Arvicola montebelli, Milne-Edwards, Rech. Mamm., p. 285 (1874).

Arvicola hatanezumi, Sasaki, Bull. Coll. Agric. Tokyo, vi, p. 51 (1904).

Microtus montebelli, Thomas, P. Z. S., 1905, ii, p. 352.

NOM. JAP. Hata-nezumi. NOM. ANG. Japanese vole.

DIST. Hondō, Kiūshiū (Thomas).

Gen. ***Evotomys*** Coues.

Evotomys, Coues, Proc. Acad. Nat. Sc. Philad., 1874, p. 186; Coues et Allen, Monogr. N. Amer. Rodent., p. 131 (1877); Miller, Proc. Biol. Soc. Wash., xiii, p. 154 (1900).

Hypudæus, Keyserling et Blasius, Wirbelth. 1842 (nec Illiger) Baird, Mamm. N. Amer. 1857, pp. 513, 515 and 518.

88. *Evotomys amurensis* (Schrenck).

Arvicola (Hypudæus) amurensis, Schrenck, Amur Land, Mamm., p. 129 (1859).

Evotomys amurensis, Thomas, P. Z. S., 1907, p. 413.

NOM. JAP. Amur-nezumi.

DIST. Hokkaidō, Saghalien (Thomas); Amur region (Schrenck).

89. *Evotomys mikado* Thos.

Evotomys mikado, Thomas, Abstr. P. Z. S., 1905, no. 23, p. 19; *ibid.*, P. Z. S., 1905, ii, p. 352; *ibid.*, 1907, p. 453.

NOM. JAP. Mikado-nezumi.

DIST. Hokkaidō (Thomas); Kuril Islands.

Gen. *Craseomys* Miller.

Crascomys, Miller, Proc. Wash. Acad. Sci., 1900, ii, p. 83 (Subgen.).

90. *Craseomys andersoni* (Thos.).

Evotomys andersoni, Thomas, Abstr. P. Z. S., 1905, no. 23, p. 18.

Evotomys (Craseomys) andersoni, Thomas, P. Z. S., 1905, ii, p. 355.

NOM. JAP. Anderson-nezumi.

DIST. N. Hondō (Thomas).

91. *Craseomys bedfordiæ* (Thos.).

Evotomys bedfordiæ, Thomas, Abstr. P. Z. S., 1905, no. 23, p. 18.

Evotomys (Craseomys) bedfordiæ, Thomas, P. Z. S., 1905, ii, p. 354.

Craseomys bedfordiæ, Thomas, P. Z. S., 1907, p. 413.

NOM. JAP. Bedford-nezumi.

DIST. Hokkaidō, Saghalien (Thomas); Kuril Islands.

92. *Craseomys niigatæ* Anderson.

Craseomys niigatæ, Anderson, Ann. Mag. N. H., (8), iv, p. 317 (1909).

NOM JAP. Niigata-nezumi.

DIST. N. Hondō : Niigata Prefecture (Anderson).

93. *Craseomys smithii* (Thos.).

Evotomys (Phaulomys) smithii, Thomas, Ann. Mag. N. H., (7), xv, p. 493 (1905); *ibid.*, P. Z. S., 1905, ii, p. 355.

Craseomys smithii, Anderson, Ann. Mag. N. H., (8), iv, p. 317 (1909).

NOM. JAP. Smith-nezumi.

DIST. Hondō, Shikoku, Kiūshiū (Thomas).

Sub-Fam. Murinæ.

Gen. *Lenothrix* Miller.

Lenothrix, Miller, Proc. U. S. Nat. Mus., xxvi, p. 466.

94. *Lenothrix legata* Thos.

Lenothrix legata, Thomas, Ann. Mag. N. H., (7), xvii, p. 88 (1906).

Mus bowersii var. *okinawensis*, Namiye, Zool. Mag. Tokyo, xxi, p. 455 (1909).

NOM. JAP. Okinawa-kinezumi.

DIST. Amami-ōshima (Thomas), Liūkiū (Namiye).

Gen. *Mus*¹ Linn.

Mus, Linnæus, S. N., (10), p. 59 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 404 (1888—91); Mearns, Smith. Inst. U. S. Nat. Mus. Bull. 56, p. 363 (1907).

Epimys, Trouessart, Bull. Soc. d'Etudes Sci. d'Anger, x, 1881,

1) Other synonyms of Gen. *Mus* are as follows (G. S. Miller):—

Musculus Rafinesque, 1814; *Leggata* Gray, 1837; *Drynomys* Tschudi, 1844; *Nannomys* Peters, 1876; *Acomys* Trouessart, 1881; *Pseudocomomys* Rhoads, 1896 *Dryomys* Philippi; *Rattus* Fitzinger, 1867.

p. 117 (type by subsequent designation *Mus rattus* Linn.); Miller, Proc. Biol. Soc. Wash., xxiii, p. 58 (1910); Lydekker, *ibid.*, p. 124 (Subgen.); Thomas, Ann. Mag. N. H., (8), vi, p. 604 (1910); *ibid.*, P. Z. S., 1911, p. 147.

95. *Mus canna* Swinhoe.

Mus — ? Swinhoe, P. Z. S., 1864, p. 382.

Mus canna, Swinhoe, P. Z. S., 1870, p. 636.

Mus alexandrinus, Swinhoe, P. Z. S., 1870, p. 635.

Mus flavipectus, Milne-Edwards, Nouv. Arch. du Mus., vii, p. 93 (1871); *idid.*, Rech. Mamm., p. 289, pl. 42, fig. 1 (1874); Bonhote, Fasc. Malay, Zoology, i, pp. 35, 37; *ibid.*, P. Z. S., 1905, ii, p. 389.

Mus ouangthomæ, Milne-Edwards, Nouv. Arch. du Mus., vii, p. 93 (1871); *ibid.*, Rech. Mamm., p. 290, pl. 40, fig. 3 (1874).

Mus plumbeus, Milne-Edwards, Rech. Mamm., p. 138, pl. 43, fig. 2 (1874).

Mus rattus flavipectus, Thomas, P. Z. S., 1898, p. 772.

DIST. China, Formosa (Bonhote).

96. *Mus caroli* Bonh.

Mus caroli, Bonhote, Novit. Zool., ix, no. 3, p. 627 (1902).

DIST. Liūkiū (Bonhote).

97. *Mus coxinga* Swinhoe.

Mus coxinga, Swinhoe, P. Z. S., 1864, pp. 185, 382; *ibid.*, 1870, p. 636; Thomas, Ann. Mus. Gen., 1892, p. 939 (foot-note).

Mus coxingi, Bonhote, Fasc. Malay, Zool., i, pp. 33, 36 (1903); *ibid.*, P. Z. S., 1905, ii, p. 386.

NOM. ANG. Spinous country-rat.

DIST. Formosa (Bonhote).

98. *Mus erythronotus* Temm.

Mus erythronotus, Temminck, Fauna Japonica, Mamm., p. 50 (1845).

DIST. China, Japan (Temminck).

99. *Mus griseipectus* M.-Edw.

Mus griseipectus, Milne-Edwards, Nouv. Arch. Mus., 1871, p. 93; *ibid.*, Rech. Mamm. p. 290, pl. 42, fig. 2 (1874); Bonhote, P. Z. S., 1905, ii, p. 392.

M. indicus, Swinhoe, P. Z. S., 1870, p. 635.

DIST. Formosa, also found in W. Fokien (Bonhote).

100. *Mus losea* Swinhoe.

Mus flavescens, Swinhoe, P. Z. S., 1864, p. 186.

Mus losea, Swinhoe, P. Z. S., 1870, p. 637; Bonhote, *ibid.*, 1905, ii, p. 391.

Mus rufescens, Swinhoe, P. Z. S., 1870, p. 636.

NOM. ANG. Brown country-rat.

DIST. This species was originally described from Tamsuy in Formosa. But there is also a specimen collected by Mr. Swinhoe at Amoy, and other specimens in the Museum from W. Fokien (Bonhote)

101. *Mus molossinus* Temm.

Mus molossinus, Temminck, Fauna Japonica, Mamm., p. 51 (1845); Thomas, P. Z. S., 1905, ii, p. 348.

DIST. Hondō, Kiūshū (Thomas).

102. *Mus musculus* Linn.

Mus musculus, Linnæus, S. N., (10), p. 62 (1758); Miller et Rehn, Proc. Bost. Soc. Nat. Hist., xxx, no. 1, 1901, p. 65;

Blanford, Fauna Brit. Ind. Mamm., p. 413 (1888—91); Flower, P. Z. S., 1900, p. 362; Elliot, Field Col. Mus. Zool. Ser. ii, 1901, p. 118; *ibid.*, iv, 1904, p. 162; Bonhote, P. Z. S., 1905, ii, p. 394; Mearns, Smith. Inst. U. S. Nat. Mus. Bull. 56, p. 366 (1907); Thomas, P. Z. S., 1911, p. 147.

NOM. JAP. Hatsuka-nezumi. NOM. ANG. Common house-mouse.
DIST. Cosmopolitan.

103. *Mus norvegicus*¹ Erxl.

Mus norvegicus Erxleben, Syst. Règne Anim., i, 1777, p. 318; Rehn, Proc. Biol. Soc. Wash., xiii, p. 167 (1900); Miller et Rehn, Proc. Bost. Soc. Nat. Hist., xxx, no. 1, Dec. 27, 1901, p. 65; Elliot, Field Col. Mus. Zool. Ser. iv, 1904 p. 164; Mearns, Smith. Inst. U. S. Nat. Mus. Bull. 56, p. 364 (1907); Bonhote, P. Z. S., 1905, ii, p. 392; Thomas, *ibid.*, 1908, p. 53.

NOM. JAP. Shichiro-nezumi or Norway-nezumi. NOM. ANG. Norway rat, Brown rat or Wharf-rat.

DIST. Cosmopolitan.

104. *Mus rattus rattus* Linn.

Mus rattus, Linnæus, S. N., (10), p. 61 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 406 (1888—91); Thomas, P. Z. S., 1881, p. 538; Elliot, Field Col. Mus. Zool. Ser. ii, 1901, p. 117, Fig. 28; *ibid.*, iv, 1901, p. 163, figg. 25, 31; Miller et Rehn, Proc. Bost. Soc. Nat. Hist., xxx, no. 1, 1901, p. 56; Mearns, Smith. Inst. U. S. Nat. Mus. Bull. 56, p. 365 (1907).

NOM. JAP. Kuma-nezumi. NOM. ANG. Black rat.

DIST. Cosmopolitan: Japan: Tokyo.

¹) Other synonyms of *Mus norvegicus* are as follows (Blanford):—

Mus decumanus Pallas, 1778; *Mus decumanoides* Hodgson; *Mus brunneus* Hodgson, 1845.

105. *Mus rattus alexandrinus* Geoff.

Mus alexandrinus, Geoffroy, Descr. de l'Égypte, Mamm., 1818, p. 733, pl. v, fig. 1; Thomas, P. Z. S., 1881, p. 533; Miller et Rehn, Proc. Bost. Soc. Nat. Hist., xxx, no. 1, 1901, p. 65; Mearns, Smith. Inst. U. S. Nat. Mus. Bull. 56, p. 366 (1907).

Mus rattus alexandrinus, Blanford, Fauna Brit. Ind. Mamm., p. 406 (1888—91).

NOM. JAP. Ezibuto-nezumi. NOM. ANG. Roof-rat, Whitebellied rat or South-European rat.

DIST. Cosmopolitan.

106. *Mus rattus rufescens* Gray.

Mus rufescens, Gray, Charlesworth's Mag. N. H., i, p. 585 (1837); Blyth, J. A. S. B., xxxii, pp. 338—344; Jerdon, Mamm., pp. 194, 197—201; Bonhote, Novit. Zool., ix, p. 627 (1902).

Mus rattus rufescens, Thomas, P. Z. S., 1881, pp. 57, 71.

NOM. JAP. Indo-nezumi. NOM. ANG. Common Indian rat.

DIST. Indian Peninsula, Ceylon, Burma (Blanford); Liūkiū (Bonhote).

107. *Mus tanezumi* Temm.

Mus tanezumi, Temminck, Fauna Japonica, Mamm., p. 51 (1845); Thomas, P. Z. S., 1905, ii, p. 348.

NOM. JAP. Ta-nezumi.

DIST. N. Hondō (Thomas).

Gen. *Bandicota* Gray.

Bandicota, Gray, Ann. Mag. N. H., (4), xii, p. 418 (1873); Thomas, ibid., (7), xx, p. 203 (1907).

108. *Bandicota bengalensis*¹ (Gray).

Arvicola bengalensis, Gray, Hardwicker's Ill. Ind. Zool., ii, pl. xxi (1833—4).

Nesokia indica, Blyth, J. A. S. B., xxxii, p. 328 (1863); *ibid.* Cat., no. 360, p. 112; Jerdon, Mamm., p. 187; Theobald, P. A. S. B., 1866, p. 240; Blyth, J. A. S. B., xlv, Burma List, p. 38.

Mus indicus, Swinhoe, P. Z. S., 1870, p. 635.

Mus (Nesokia) bengalensis, Thomas, P. Z. S., p. 526 (1881); Murray, Zool. Sind, p. 44; Anderson, Journ. Linn. Soc., xxi, p. 341.

Nesokia bengalensis, Sclater, Cat. Mamm. Ind. Mus., ii, p. 55 (1891).

DIST. This rat is found over the whole of India, from Kashmir and Sind in the north-west and from Cachar in the north-east southwards; it is also recorded from Ceylon and Tenasserim, and probably occurs throughout Burma (Sclater); Formosa (Swinhoe).

Gen. *Apodemus* Kaup.

Apodemus, Kaup, Entwick. gesch. nat. syst. für europ. Thierw., 1829, p. 145.

Micromys, Dehn, Hoflössnitz, 1841; Thomas, Ann. Mag. N. H. (7), xv, p. 491 (1905); Bonhote, P. Z. S., 1905, ii, p. 349.

109. *Apodemus geisha geisha* (Thos.).

Micromys geisha, Thomas, Ann. Mag. N. H., (7), xv, p. 491 (1905); *ibid.*, P. Z. S., 1905, ii, p. 350.

Apodemus geisha, Thomas, P. Z. S., 1908, p. 47.

NOM. JAP. Hime-nezumi.

DIST. Hondō, Shikoku, Kiūshiū (Thomas).

1) Other synonyms of *Bandicota bengalensis* are as follows (Sclater):—

Mus deccanensis Tytler, 1854; *Mus tarayensis* Horsfield, 1855; *Mus plurimammis* Horsfield, 1855; *Mus morungensis* Horsfield, 1855; *Mus (Nesokia) blythianus* Anderson, 1878; *Mus (Nesokia) barclayanus* Anderson, 1878.

110. *Apodemus geisha celatus* (Thos.).

Micromys geisha celatus, Thomas, P. Z. S., 1905, ii, p. 359.

Apodemus geisha celatus, Thomas, P. Z. S., 1908, p. 47.

DIST. Okishima (Thomas).

111. *Apodemus geisha hokkaidi* (Thos.).

Micromys geisha hokkaidi, Thomas, P. Z. S., 1905, ii, p. 350;
ibid., 1907, p. 412.

Apodemus geisha hokkaidi, Thomas, P. Z. S., 1908, p. 47.

DIST. Hokkaidō, Saghalien (Thomas.).

112. *Apodemus geisha sagax* Thos.

Apodemus geisha sagax, Thomas, P. Z. S., 1908, p. 54.

DIST. Tsushima (Thomas).

113. *Apodemus geisha yakui* (Thos.).

Micromys geisha yakui, Thomas, P. Z. S., 1905, ii, p. 362.

Apodemus geisha yakui, Thomas, P. Z. S., 1908, p. 47.

DIST. Yakushima (Thomas).

114. *Apodemus minutus minutus* (Pall.).

Mus minutus, Pallas, Nov. Spec., pp. 96, 345 (1779); Barrett-Hamilton, Ann. Mag. N. H., (7), iii, p. 343 (1899); ibid., v, p. 529 (1900).

Apodemus minutus, Thomas, P. Z. S., 1908, p. 54.

NOM. JAP. Kaya-nezumi or Haka-nezumi.

DIST. Siberia (Barret-Hamilton), Tsushima (Thomas).

115. *Apodemus minutus japonicus* (Thos.).

Micromys minutus japonicus, Thomas, P. Z. S., 1905, ii, p. 351.

Apodemus minutus japonicus, Thomas, P. Z. S., 1908, p. 47.

DIST. Hondō, Shikoku, Kiūshiū (Thomas).

116. *Apodemus semotus* Thos.

Mus — Swinhoe, P. Z. S., 1864, p. 382.

?*Mus badius*, Swinhoe, P. Z. S., 1870, p. 637.

Apodemus semotus, Thomas, Ann. Mag. N. H., (8), i, p. 447 (1908).

DIST. Central Formosa: Mt. Arizan (Thomas).

117. *Apodemus speciosus speciosus* (Temm.).

Mus speciosus, Temminck, Fauna Japonica, Mamm., p. 52 (1845).

?*Mus argenteus*, Temminck, Fauna Japonica, Mamm., p. 51 (1845).

Mus speciosus, Thomas, P. Z. S., 1905, ii, p. 348.

Apodemus speciosus, Thomas, P. Z. S., 1908, p. 53; *ibid.*, ii, p. 641.

NOM. JAP. Yama-nezumi or Chi-nezumi.

DIST. Hondō, Shikoku, Kiūshiū (Thomas).

118. *Apodemus speciosus ainu* (Thos.).

Micromys speciosus ainu, Thomas, P. Z. S., 1905, ii, p. 349; *ibid.*, 1907, p. 412.

Apodemus speciosus ainu, Thomas, P. Z. S., 1908, p. 47.

DIST. Hokkaikō (Thomas), Kuril Islands.

119. *Apodemus speciosus giliacus* (Thos.).

Micromys speciosus giliacus, Thomas, P. Z. S., 1907, p. 411.

DIST. Saghalien (Thomas).

120. *Apodemus speciosus navigator* (Thos.).

Micromys speciosus navigator, Thomas, P. Z. S., 1905, ii, p. 358.

Apodemus speciosus navigator, Thomas, P. Z. S., 1908, p. 47.

DIST. Okishima (Thomas).

Fam. DIPODIDÆ.

Sub-Fam. Sicistinae.

Gen. *Sicista*¹ Gray.

Sicista, Gray, Griff. Anim. Kingd., p. 228 (1827).

121. *Sicista caudata* Thos.

Sicista caudata, Thomas, P. Z. S., 1907, p. 413.

DIST. Saghalien (Thomas).

Per. HYSTRICOMORPHA.

Fam. HYSTRICIDÆ.

Gen. *Hystrix*² Linn.

Hystrix, Linnæus, S. N., (10), p. 56 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 441 (1888-91).

122. *Hystrix subcristata*³ Swinhoe.

Hystrix sp., Swinhoe, P. Z. S., 1864, p. 378; Allen, Bull. Amer. Mus. Nat. Hist., xxii, p. 472 (1906).

Hystrix hodgsoni, Swinhoe, P. Z. S., 1870, p. 233.

Hystrix subcristata, Swinhoe, P. Z. S., 1870, p. 638.

NOM. JAP. Yamaarashi. NOM. ANG. Sub-crested porcupine.

DIST. Hainan, ?Formosa (Swinhoe).

1) Synonymous with *Sminthus* Keys. & Blas. 1839. (Thomas).

2) Other synonyms of Gen. *Hystrix* are as follows (Blanford):—
Acanthion Cuvier; *Acanthocheerus* Gray.

3) R. Swinhoe says:—"The porcupine occurs in Hainan, but in Formosa I have never detected it. The Taiwanfoo Gazetteer (a Chinese work), however, includes it in its list of the natural productions of that island" (see P. Z. S., 1870, p. 639).

Ord. CARNIVORA.

Trunk CARNIVORA FISSIPEDIA.

Sub-Ord. HERPESTOIDEA.¹

Fam. FELIDÆ.

Gen. *Felis*² Linn.

Felis, Linnæus, S. N., (10), p. 41 (1758); Sclater, Cat. Mamm. Ind. Mus., ii, p. 212 (1891).

123. *Felis bengalensis* Kerr.

Felis bengalensis, Kerr., Anim. Kingd., p. 151 (1792); Blyth, Cat., p. 60; *ibid.*, P. Z. S., 1863, p. 184; Jerdon, Mamm., p. 105; Anderson, Anat. Zool. Res., p. 164 (1878); Elliot, Monogr. Felidæ, pl. xxi; Blanford, P. Z. S., 1887, p. 627; *ibid.*, Fauna Brit. Ind. Mamm., p. 78 (1888—91); Flower, P. Z. S., 1900, p. 325.

Felis chinensis, Gray, Ann. Mag. N. H., 1837, i, p. 577; *ibid.*, P. Z. S., 1867, pp. 274, 400; Swinhoe, *ibid.*, 1870, p. 629.

NOM. ANG. Chinese tiger-cat or Leopard-cat.

DIST. Common in the Himalayas as far west as Simla, Lower Bengal, Assam, the Burmese and Malayan Countries, S. China, Sumatra, Java, Borneo and Philippines (Blanford); Formosa (Swinhoe).

1) Other synonyms of Subord. Herpestoidea Winge are as follows (Weber):—

Aeluroidea Flower; Epimycteri cope.

2) Other synonyms of Gen. *Felis* are as follows (Sclater):—

Leo Gray, 1843; *Tigris* Gray, 1843; *Leopardus* Gray, 1843; *Caracal* Gray, 1843; *Chaus* Gray, 1843; *Lynx* Gray, 1843; *Uncia* Gray, 1854; *Ailurina* Gervais, 1855; *Neofelis* Gray, 1867; *Catolynx* Gray, 1867; *Viverriceps* Gray, 1867; *Serval* Gray, 1874; *Pyrofelis* Gray, 1874.

124. *Felis lynx* Linn.

Felis lynx, Linnæus, S. N., (10), p. 43 (1758); Blyth, Cat., p. 64; Radde, Ost. Siberien, p. 89; Schrenck, Amur. Land, Mamm., p. 87 (1859); Severtzoff, Ann. Mag. N. H., (4), xviii, p. 49; Alston, P. Z. S., 1877, p. 272; *ibid.*, 1880, p. 52; Elliot, Monogr. Felidæ, pl. xxxix; Scully, P. Z. S., 1881, p. 201; Blanford, Fauna Brit. Ind. Mamm., p. 89 (1888—91).

Felis isabellina, Blyth, J. A. S. B., xvi, p. 1178 (1847); *ibid.*, Cat., p. 64; *ibid.*, P. Z. S., 1863, p. 186.

NOM. JAP. Ō-yamaneko. NOM. ANG. European lynx.

DIST. Thibet, also throughout Asia north of the Himalayas, Europe north of the Alps (Blanford); Siberia, Saghalien (Schrenck).

125. *Felis microtis* M.-Edw.

Felis microtis, Milne-Edwards, Rech. Mamm., p. 221, (1872); Thomas, P. Z. S., 1908, p. 52.

NOM. JAP. Yamaneko. NOM. ANG. Wild cat.

DIST. Tsushima, Korea (Thomas).

126. *Felis nebulosa* Griffith.

Felis nebulosa, Griffith, Carnivora, p. 37 (1821); Blanford, Fauna Brit. Ind. Mamm., p. 72 (1888—91); Flower, P. Z. S., 1900, p. 324.

Felis macrocelis, Temminck, Horsf. Zool. Journ., i, p. 543 (1825); Tickell, J. A. S. B., xii, p. 814; Blyth, Mamm. Birds Burma, p. 27; Swinhoe, P. Z. S., 1870, pp. 228, 628.

Neofelis macrocelis, Gray, P. Z. S., 1867, p. 266; *ibid.*, Cat., Carn. Brit. Mus., p. 13 (1869).

Leopardus brachyurus, Swinhoe, P. Z. S., 1862, p. 352; *ibid.*, 1870, p. 4; Blanford, Fauna Brit. Ind. Mamm., p. 72 (1888—91).

NOM. ANG. Clouded tiger or Clouded leopard.

DIST. The S. E. Himalayas, Sikhim, Bhutan, etc., at moderate elevations, probably not above 7000 ft. It is also found in the Assam

hills and throughout the hilly parts of Burma, Siam, the Malay Peninsula, Sumatra, Java and Borneo (Blanford). Formosa (Swinhoe).

127. *Felis tigris* Linn.

Felis tigris, Linnæus, S. N., (10), p. 41 (1758); Raffles, Trans. Linn. Soc., xiii, p. 249; Sykes, P. Z. S., 1831, p. 102; Elliot, Madras Journ., x, p. 104; Cantor, J. A. S. B., xv, p. 243; Horsfield, Cat. E. Ind. Mus., p. 43; Blyth, Cat., p. 54; Schrenck, Amur Land, Mamm., p. 92 (1859); Blyth, P. Z. S., 1863, p. 182; Jerdon, Mamm., p. 92; Mac-Master, Notes on Jerdon, pp. 19, 150; Swinhoe, P. Z. S., 1870, p. 626; Dode, *ibid.*, 1871, p. 480; Stoliczka, J. A. S. B., xli, p. 226; Blyth, J. A. S. B., xliv, Burma list, p. 27; Blanford, Persia, p. 34; Severtzoff, Ann. Mag. N. H., (4), xviii, p. 49 (1876); Anderson, Anat. Zool. Res. p. 160 (1878); Elliot, Monogr. Felidæ, no. 3; Sterndale, Mamm. Ind. p. 161; Inverarity, Journ. Bomb. Soc., iii, p. 143; Thomas, Trans. Linn. Soc., (2), v, p. 55; Radde, Zool. J. B., iv, p. 1009; Anderson, Journ. Linn. Soc., xxi, p. 338; Blanford, Fauna Brit. Ind. Mamm., p. 58 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 216 (1891).

Tigris regalis, Gray, List Mamm. Brit. Mus., p. 40 (1843); *ibid.*, Cat. Hodgs. Coll., 1st ed. p. 4; Adams, P. Z. S., 1858, p. 513; Gray, Cat. Carn. Brit. Mus., p. 10 (1869); *ibid.*, P. Z. S., 1869, p. 263.

NOM. JAP. Tora. NOM. ANG. Tiger.

DIST. India, Burma, and other parts of S. E. Asia, Java, Sumatra, but not Ceylon, nor it is said, Borneo. The tiger occurs in suitable localities throughout a great part of Central Asia, and is found in the Valley of the Amur, the Altai Mountains, around Lob Nor in E. Turkestan, about the Sea of Aral, on the Murghâb near Herat, on the S. Coast of the Caspian (Hyrcania), and in the Caucasus, but not in Tibet, Afganistan, Baluchistan, or Persia south of the Elburz Mountains on the Caspian (Blanford). Saghalien (Schrenck).

128. *Felis uncia* Schreb.

Felis uncia, Schreber. Säugeth., iii, p. 386, pl. c (1778); Blyth, Cat., p. 58; *ibid.*, P. Z. S., 1863, p. 183; Jerdon, Mamm., p. 101; Lydekker, J. A. S. B., xlv, p. 284; Blanford, Yarkand Mamm., p. 19; *ibid.*, Persia, p. 35; Dode, P. Z. S., 1871, p. 480; Elliot, Monogr. Felidæ, no. 4; Sterndale, Mamm. Ind., p. 184; Blanford, Fauna Brit. Ind. Mamm., p. 71 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 217 (1891).

Felis pardus, Pallas, Zool. Rosso Asiat., i, p. 17 (1811).

Felis irbis, Ehrenberg, Ann. Sci. Nat., xxxi, p. 394 (1830); Radde, Ost Siberien, i, p. 104; Schrenck, Amur Land, Mamm., p. 96 (1859); Severtzoff, Ann. Mag. N. H., (4), xviii, p. 49 (1876); Milne-Edwards, Rech. Mamm., p. 213.

Leopardus uncia, Gray, List Mamm. Brit. Mus., p. 41 (1843); *ibid.* Cat. Carn. Brit. Mus., p. 9 (1869).

Felis uncioides, Horsfield, Ann. Mag. N. H., (2), xvi, p. 105 (1855).

NOM. ANG. Ounce or Snow-leopard.

DIST. All the high regions of Central Asia, Gilgit, Hunza, Turkestan, Trans-Baikalia, Persia, W. China (Sclater); Siberia, Saghalien (Schrenck).

129. *Felis viverrina* Bennett.

Felis viverrina, Bennett, P. Z. S., 1833, p. 63; Horsfield, Cat. E. Ind. Mus., p. 49; Blyth, P. Z. S., 1863, p. 184; Jerdon, Mamm., p. 103; MacMaster, Notes on Jerdon, p. 28; Swinhoe, P. Z. S., 1870, p. 628; Blyth, J. A. S. B., xlv, Burma List, p. 27; Atkinson, N. W. P.

Leopardus japonensis was described by Gray, J. E. (P. Z. S., 1862, p. 262) as a new species from a specimen which was said to have come from Japan. Sclater identified that species with *Felis pardus* Linn. which occurs in Africa, Asia Minor, Persia, Bulchistan, India, Assam, Ceylon, Burma, Malay Peninsula, Sumatra, Java and China (see Sclater, Cat. Mamm. Ind. Mus., 1891, p. 218). I consider it exceedingly doubtful that a leopard was ever found living wild in this country.

Gazett., xi, p. 17; Spearman, Burma Gazett., p. 551; Elliot, Monogr. Felidæ, no. 21; Murray, Zool. Sind, p. 28; Blanford, Fauna Brit. Ind. Mamm., p. 76 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 225 (1891).

Felis viverriceps, Hodgson, J. A. S. B., v, p. 232 (1836); Kelaart, Prodr. Fauna Zeylan., p. 46.

Felis himalayana, Jardine, Nat. Libr. Mamm., ii, p. 230 (1837).

Leopardus viverrinus, Gray, List. Mamm., Brit. Mus., p. 43 (1843).

Leopardus celidogaster, Gray, Cat. Hogs. Coll. 1st ed. p. 6 (1846).

Felis celidogaster, Blyth, Cat., no. 179, p. 61 (1863).

Viverriceps bennettii, Gray, P. Z. S., 1867, p. 268; *ibid.*, Cat. Carn. Brit. Mus., p. 16 (1869).

NOM. ANG. Large tiger-cat or Fishing cat.

DIST. India, Ceylon, Lower Burma, Tenasserim and Formosa (Sclater).

Fam. VIVERRIDÆ.

Sub-Fam. Viverrinæ.

Gen. *Viverricula* Hodgs.

Viverricula, Hodgson, Ann. Mag. N. H., 1838, i, p. 152; *ibid.* J. A. S. B., x, p. 909 (1841); Gray, P. Z. S., 1864, p. 513; *ibid.*, Cat. Carn. Brit. Mus., p. 47 (1869); Mivart, P. Z. S., 1882, p. 149; *ibid.*, 1885, p. 477; Blanford, Fauna Brit. Ind. Mamm., p. 100 (1888—91).

130. *Viverricula malaccensis*¹ (Gmel.).

Viverra malaccensis, Gmelin, Linn., S. N., (13), i, p. 92 (1788); Gray, Cat. Hodgs. Coll., 1st ed. p. 8; Jerdon, Mamm., p. 122; Stern-dale, Mamm. Ind., p. 211.

1) Other synonyms of *Viverricula malaccensis* are as follows (Sclater):—

Viverra leveriana Shaw, 1793; *Viverra indica*, 1817; *Viverra rasse* Horsfield, 1842; *Viverra bengalensis* Gray, 1832; *Viverra pallida* Gray, 1832; *Viverricula indica* Hodgson, 1841.

Viverricula malaccensis, Cantor, J. A. S. B., xv, p. 199 (1846); Kelaart, Prodr. Fauna Zeylan., p. 37; Blyth, Cat., no. 143, p. 45; Gray, P. Z. S., 1864, p. 153; *ibid.*, Cat. Carn. Brit. Mus., p. 47 (1869); Swinhoe, P. Z. S., 1870, pp. 227, 630; Atkinson, N. W. P. Gazett., xi, p. 19; Blyth, J. A. S. B., xlv, Burma List, p. 25; Anderson, Anat. Zool. Res., p. 166 (1878); Spearman, Burma Gazett., p. 548; Thomas, P. Z. S., 1886, p. 55; Blanford, Fauna Brit. Ind. Mamm., p. 100 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 238 (1891).

NOM. ANG. Little spotted civet or Small Indian civet.

DIST. Throughout India, Ceylon, Assam, Burma, S. China, Malay Peninsula, Java, some of Malay Islands (Blanford); Formosa (Swinhoe).

Gen. *Paradoxurus* Cuv.

Paradoxurus, Cuvier, Hist. Nat. Mamm., pl. 186 (1821); Blanford, Fauna Brit. Ind. Mamm., p. 105 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 242 (1891).

Pagma, Gray, P. Z. S., 1831, p. 95.

Platyschista, Otto, Nova Acta Acad. Leop. Caro., xvii, p. 1089 (1835).

131. *Paradoxurus larvatus* (Temm.).

Gulo larvatus, Temminck, Hamilton-Smith, Griff. Anim. Kingd., ii, p. 281 (1827).

Viverra larvata, Gray, Spic. Zool., p. 9 (1830).

Pagma larvata, Gray, P. Z. S., 1831, p. 95; *ibid.*, List. Mamm. Brit. Mus., 1843, p. 54; Swinhoe, P. Z. S., 1862, p. 354; Gray, *ibid.*, 1864, p. 539; *ibid.*, Cat. Carn. Brit. Mus., 1869, p. 72; Swinhoe, P. Z. S. 1870, p. 360; *ibid.*, 1872, p. 817.

Paradoxurus larvatus, Gray, P. Z. S., 1832, p. 67; *ibid.*, Hardwicker's Ill. Ind. Zool., ii, pl. 11 (1834); Temminck, Monogr. Mamm., ii, p. 329, pl. 65, figg. 1—3 (1835—41); Wagner, Supp. Schreb. Säugeth., ii, p. 351 (1841); Schinz, Syn. Mamm., i, p. 384 (1844); Giebel,

Säugeth., p. 798; Blanford, P. Z. S., 1885, p. 805.

Pagma larvata var. *taivana*, P. Z. S., 1862, p. 8.

NOM. ANG. Gem-faced civet.

DIST. China, Formosa (Swinhoe).

Sub-Fam. **Herpestinæ.**

Gen. ***Mungos***¹ Geoff. et Cuv.

Mungos, Geoffroy et Cuvier, Mag. Encyclop. ii, (6), 1795, p. 187; Ogilby, P. Z. S., 1835, p. 103.

Herpestes, Illiger, Prodr. Syst. Mamm., p. 135 (1811); Thomas, P. Z. S., 1882, p. 63; Sclater, Cat. Mamm. Ind. Mus., ii, p. 250 (1891).

132. *Mungos urva* (Hodgs.).

Gulo urva, Hodgson, J. A. S. B., v, p. 238 (1836); MacClelland, Calc. Journ. N. H., ii, p. 458.

Urva cancrivora, Hodgson, J. A. S. B., vi, p. 561 (1837); Gray, Cat. Hodgs. Coll., 1st ed. p. 8; Horsfield, Cat. F. Ind. Mus., p. 93; Blyth, Cat., no. 158, p. 49; Jerdon, Mamm., p. 138; Swinhoe, P. Z. S., 1870, p. 630; Blyth, J. A. S. B., xlv, Burma List, p. 26; Spearman, Burma Gazett., p. 550.

Mesobema cancrivora, Hodgson, J. A. S. B., x, p. 910 (1841).

Osmectectis fusca, Gray, Ann. Mag. N. H., 1842, x, p. 910.

Herpestes urva, Anderson, Anat. Zool. Res., p. 189, pl. ix, figg. 5, 6 (1878); Blanford, Fauna Brit. Ind. Mamm., p. 129 (1888—91); Flower, P. Z. S., 1900, p. 331.

NOM. JAP. Kanikui-mangūsu. NOM. ANG. Crab-eating mongoose.

DIST. The S. E. Himalayas at low elevations, Assam, Burma, Siam and S. China (Flower); Formosa.

1) Other synonyms of Gen. *Mungos* are as follows (Sclater):—

Ichneumon Lacépède, 1801; *Mangusta* Olivier, 1829; *Urva* Hodgson, 1837; *Mesobema* Hodgson, 1841; *Osmectectis* Gray, 1842; *Calogale* Gray, 1864; *Calictis* Gray, 1864; *Taniogale* Gray, 1864; *Cnychogale* Gray, 1864.

Sub-Ord. ARCTOIDEA.¹

Fam. CANIDÆ.

THOOIDEA.

Gen. *Canis*² Linn.

Canis, Linnæus, S. N., (10), p. 38 (1758); Blanford, Fauna Brit. Ind, Mamm., p. 135 (1888—91).

133. *Canis alpinus* Pall.

Canis alpinus, Pallas, Zool. Rosso Asiat., i, p. 34 (1831); Blyth, Cat., p. 38; Van der Hoven, Verh. Kon. Akad. Amster., 1856, iii; Schrenck, Amur Land, Mamm., p. 48 (1859); Radde, Ost Siberien, p. 60; Severtzoff, Ann. Mag. N. H., (4), xviii, p. 48 (1876).

Cuon alpinus, Gray, Ann. Mag. N. H., 1846, xvii, p. 293; Gray, Cat. Carn. Brit. Mus., p. 184 (1869); Sclater, Cat. Mamm. Ind. Mus., ii, p. 261 (1891).

DIST. Highland of Central Asia, Turkestan, Thibet, Siberia (Sclater); Saghalien (Schrenck).

134. *Canis hodophylax* Temm.

Canis hodophylax, Temminck, Fauna Japonica, Mamm., p. 38 (1844); Thomas, P. Z. S., 1905, ii, p. 342.

NOM. JAP. Yama-inu. NOM. ANG. Japanese wolf.

DIST. Hondō (Thomas), China.

135. *Canis lupus* Linn.

Canis lupus, Linnæus, Fauna Suec., 3; ibid., S. N., (12), i, p. 58 (1766); Gerrard, Cat. Bones Mamm., p. 84; Hutton, J. A. S. B., xiv,

1) Sub-Ord. Arctoidea Winge is synonymous with Arctocyoniidae Flower and Hypomycteri Cope.

2) In this catalogue, the following genera are held to be synonymous with Gen. *Canis*: —*Lupus*, *Cuon* and *Cyon*.

p. 345; Blyth, Cat., p. 39; Schrenck, Amur Land, Mamm., p. 44 (1859); Scully, Ann. Mag. N. H., (4), xviii, p. 48 (1876); Danford, P. Z. S., 1877, p. 273; Danford et Alston, P. Z. S., 1880, p. 53; Scully, Ann. Mag. N. H., (5), viii, p. 224 (1881); Middendorff, Siberische Reise, ii, pt. ii, p. 70; Severtzoff, Ann. Mag. N. H., (4), xviii, p. 48 (1876); Blanford, Persia, p. 37; *ibid.*, Yarkand Mamm., p. 20; Scully, P. Z. S., 1881, p. 201; *ibid.*, J. A. S. B., lvi, p. 60; Thomas, Trans. Linn. Soc., (2), v, p. 57; Blanford, Fauna Brit. Ind. Mamm., p. 135 (1888—91); Sclater, Cat. Mamm., Ind. Mus., ii, p. 262 (1891); Radde, Zool. J. B., iv, p. 1017; Allen, Bull. Amer. Mus., Nat. Hist., xix, p. 166 (1903); Thomas, P. Z. S., 1911, p. 134; Hatta, Zool. Mag. Tokyo, xxv, no. 291 (1913).

Lupus vulgaris, Brisson, Regn. Anim., p. 235 (1758); Smith, Jard. Nat. Libr., ix, p. 148 (1839); Gray, P. Z. S., 1868, p. 501; *ibid.*, Cat. Carn. Brit. Mus., p. 186 (1869).

NOM. JAP. Ōkami. NOM. ANG. European wolf.

DIST. Throughout Palearctic region, extending in to Baluchistan, W. Sind, and probably into N. Punjab (Blanford); Amur region and Saghalien (Schrenck); absolutely rare in Hokkaidō (Hatta).

Gen. *Nyctereutes* Temm.

Nyctereutes, Temminck, Fauna Japonica, Mamm, 1844, p. 41 (Subgen.)

136. *Nyctereutes albus* Beard.

Nyctereutes albus, Beard, Sci. Amer. 1904, p. 237; Thomas, P. Z. S., 1905, ii, p. 336.

DIST. ?Hokkaidō (Thomas).

137. *Nyctereutes procyonoides* (Gray).

Canis procyonoides, Gray, Hardwicker's Ill. Ind. Zool. ii, pl. i, (1833); Schrenck, Amur Land, Mamm., p. 53 (1859), Sclater, Cat.

Mamm. Ind. Mus., ii, p. 266 (1891).

Canis (Nyctercutes) viverrinus, Temminck, Fauna Japonica, Mamm., p. 40 (1844); Schrenck, Amur Land, Mamm., p. 53 (1859).

Nyctercutes procyonoides, Gray, List Mamm. Brit. Mus., p. 62 (1843); Gerrard, Cat. Bones. Mamm., p. 89; Thomas, P. Z. S., 1907, p. 464.

Nyctereutes viverrinus, Thomas, P. Z. S., 1905, ii, p. 343.

NOM. JAP. Tanuki or Muzina. NOM. ANG. Raccoon-like dog.

DIST. E. Asia from Amur Land to Canto, Japan: Hondō, Shikoku, Kiūshiū and Hokkaidō, but not Formosa (Sclater).

ALOPECOIDEA.

Gen. *Vulpes* Briss.

Vulpes, Brisson, Regn. Anim., 1758; Huxley, P. Z. S., 1880, p. 286; Blanford, Fauna Brit. Ind. Mamm., p. 147 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 267 (1891).

Cynalopex, Smith, Jard. Nat. Libr., ix, p. 222 (1839).

138. *Vulpes japonicus* Gray.

?*Canis vulpes*, Temminck, Fauna Japonica, Mamm., p. 39 (1844).

Vulpes japonicus, Gray, P. Z. S., 1868, p. 517; *ibid.*, Cat. Carn. Brit. Mus., p. 204 (1869); Gerrard, Cat. Bones Mamm., p. 86.

NOM. JAP. Kitsune. NOM. ANG. Japanese fox.

DIST. Hondō, Shikoku, Kiūshiū and Hokkaidō.

139. *Vulpes lagopus* (Linn.).

Canis lagopus, Linnæus, S. N., (10), p. 40 (1758); Pallas, Zool. Rosso Asiat., i, p. 51 (1811); Blainville, Ostéogr., t. 5 (skull); Sclater, Cat. Mamm. Ind. Mus., ii, p. 264 (1891).

Canis (Vulpes) lagopus, Richardson, Fauna B. Amer., i, p. 83, (1829).

Vulpes lagopus, Audubon et Bachman, N. Amer. Quadr., iii, t. 122; Baird, Mamm. N. Amer., 137.

Leucocyon lagopus, Gray, P. Z. S., 1868, p. 521.

NOM. JAP. Hokkiyoku-gitsune. NOM. ANG. Arctic fox.

DIST. Arctic region of both continents (Sclater).

140. *Vulpes pennsylvanicus argentatus* (Shaw).

Canis argentatus, Shaw, Zool., i, p. 328.

Vulpes pennsylvanica var. *argentata*, Gray, P. Z. S., 1868, p. 518.

NOM. JAP. Kuro-gitsune. NOM. ANG. Black fox or Silver fox.

DIST. N. America (Gray), Kuril Islands.

141. *Vulpes pennsylvanicus decussatus* (Geoff.).

Canis decussatus, Geoffroy, Mus. Par.; Desmarest, Mamm., p. 203.

Vulpes pennsylvanica var. *decussata*, Gray, P. Z. S., 1868, p. 518.

NOM. JAP. Ziuji-gitsune. NOM. ANG. Cross fox.

DIST. N. America (Gray); Hokkaidō, Kuril Islands.

142. *Vulpes pennsylvanicus fulvus* (Rich.).

Canis fulvus, Richardson, Fauna B. Amer., p. 93 (1829); Audubon et Bachman, N. Amer. Quadr., ii, pp. 263, 414, tt. 87, 116; *ibid.*, iii, p. 70; Desmarest, Mamm., 203.

Vulpes fulvus, Baird, N. Amer. Mamm., p. 123; Gerrard, Cat. Bones Mamm., p. 58.

Vulpes pennsylvanica var. *fulva*, Gray, P. Z. S., 1868, p. 518.

NOM. JAP. Beni-gitsune. NOM. ANG. Red fox.

DIST. N. America (Gray); Hokkaidō, Kuril Islands.

Fam. URSIDÆ.

Gen. *Ursus* Linn.

Ursus, Linnæus, S. N., (10), p. 47 (1758); Mivart, P. Z. S., 1885, p. 389; Blanford, Fauna Brit. Ind. Mamm., p. 193 (1888—91).

Helarctos, Horsfield, Zool. Journ., ii, p. 221 (1826).

143. *Ursus arctos* Linn.

Ursus arctos, Linnæus, S. N., (10), p. 47 (1758); Blyth, Cat., no. 223, p. 75; Radde, Ost Siberien, i, p. 1; Schrenck, Amur Land, Mamm., p. 8 (1859); Alston, P. Z. S., 1877, p. 275; Günther, P. Z. S., 1880, p. 442.

Ursus pyrenaicus, Cuvier, Hist. Nat. Mamm. livr., xlii (1824).

Ursus collaris, Cuvier, Hist. Nat. Mamm. livr., xlii (1824).

Ursus ferox, Temminck, Fauna Japonica, Mamm., p. 29 (1844).

Ursus arctus yesoensis, Lydekker, P. Z. S., 1897, p. 422.

NOM. JAP. Hi-guma. NOM. ANG. Brown bear.

DIST. Europe, N. Asia, Asia Minor: northern part, Amur region, Hokkaidō and Kuril Islands (Sclater).

144. *Ursus japonicus* Schlegel.

Ursus tibetanus, Temminck, Fauna Japonica, Mamm., 1844, p. 29 (nec Cuv.).

Ursus japonicus, Schlegel, Handl. Boefning Dierk., i, p. 42 (1857); Sclater, P. Z. S., 1862, p. 261; Gray, Cat. Carn. Brit. Mus., p. 227 (1869); Günther, P. Z. S., 1880, p. 442; Sclater, Cat. Mamm. Ind. Mus., ii, p. 305 (1891).

NOM. JAP. Tsukinowa-guma. NOM. ANG. Japanese black bear.

DIST. Japan: Hondō.

145. *Ursus tibetanus* Cuv.

Ursus tibetanus (= *thibetanus*), Cuvier, Hist. Nat. Mamm. livr., xli (1824); *ibid.*, Ossements Foss., 3rd ed. iv, p. 325; Blyth, Cat., no. 225, p. 76; Jerdon, Mamm., p. 70; Atkinson, N. W. P. Gazett., xi, p. 10; Lydekker, J. A. S. B., xlv, pt. 2, p. 285; Swinhoe, P. Z. S., 1870, pp. 230, 621; Anderson, Anat. Zool. Res. introd., p. xxi (1878); Murray, Zool. Sind, p. 39; *ibid.*, Ann. Mag. N. H., (5), xiv, p. 98; Kinloch, Large game-shooting, i, p. 49.

Helarctos malayanus, Hodgson, J. A. S. B., i, p. 340 (1832).

Ursus torquatus, Wagner, Supp. Schreb. Säugeth., ii, p. 144, pl. 141, d, (1841); *ibid.*, Hugel's Kaschmir, iv, p. 570; Gray, Cat. Carn. Brit. Mus., p. 225 (1869); Blanford, J. A. S. B., xlv, p. 320; Sterndale, Mamm. Ind., p. 113; Blanford, Fauna Brit. Ind. Mamm., p. 197 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 303 (1891).

Ursus ferrox, Robinson, Assam, p. 96 (1841).

Helarctos tibetanus, Gray, List. Mamm. Brit. Mus., p. 73 (1843); *ibid.*, Cat. Hodgs. Coll., 1st ed. p. 15; Horsfield, Cat. E. Ind. Mus., p. 122; Adams, P. Z. S., 1858, p. 518; Swinhoe, *ibid.*, 1862, p. 351.

Ursus formosanus (*formosianus* by Sclater's Cat.), Swinhoe, P. Z. S., 1864, p. 380.

Ursus gedrosianus, Blanford, J. A. S. B., xlv, p. 317 (1877); *ibid.*, P. A. S. B., p. 4, (1879).

NOM. JAP. Himalaya-guma. NOM. ANG. Himalayan black bear.

DIST. Throughout the forest regions of the Hymalayas, extending westward through parts of Afganistan into Baluchistan and Khirther range on the western frontier of Sind. The western limits are about the frontier of Persia. Assam, S. China, Hainan and Formosa (Blanford).

Fam. MUSTELIDÆ.

Sub-Fam. Mustelinæ.

Gen. *Mustela* Linn.

Mustela, Linnæus, S. N., (10), 1758, p. 45 (pars); Alston, P. Z. S., 1899, p. 468; Thomas, *ibid.*, 1911, p. 138.

Putorius, Cuvier, Règne Anim., 1st ed. 1817, i, p. 147 (Subgen.); Nilsson, Skand. Fauna, 1820 (full gen.); Mivart, P. Z. S., 1885, p. 379; Blanford, *ibid.*, 1887, p. 636; *ibid.*, Fauna Brit. Ind. Mamm., p. 162 (1888—91).

Factorius, Keyserling et Blasius, Wirbelth. Europ., p. 21 (1840).

Vison, Gray, List Mamm. Brit. Mus., p. 64 (1843).

Gymnopus, Gray, P. Z. S., p. 118 (1865).

146. *Mustela erminea* Linn.

Mustela erminea, Linnæus, S. N., (10), p. 46 (1758); Hodgson, J. A. S. B., vi, p. 564; *ibid.*, x, p. 909; *ibid.*, xi, p. 280; Gray, Cat. Hodgs. Coll., 1st ed. p. 13; Adams, P. Z. S., 1858, p. 517; Blyth, Cat., no. 201, p. 68; Radde, Ost Siberiens, p. 52; Nilsson, Skand. Fauna, p. 157; Gerrard, Cat. Bones Mamm., p. 93; Pallas, Zool. Rosso Asiat., i, p. 90; Buffon, H. N., vii, tt. 29, 5, 2, t. 31; Gray, P. Z. S., 1865, p. 111; Schrenck, Amur Land, Mamm., p. 40 (1859); Gray, Cat. Carn. Brit. Mus., p. 88 (1869); Severtzoff, Ann. Mag. N. H., (4), xviii, p. 45 (1876); Brauns, Jena. Zeit. Zool., xvii, p. 454; Blanford, Yarkand Mamm., p. 32.

Putorius erminea, Owen, Brit. Foss. Mamm., p. 116 (skull); Griffith, Anim. Kingd., v, p. 122 (1827); Coues, Fur-bearing Animals N. Amer., p. 109; Blanford, Fauna Brit. Ind. Mamm., p. 165 (1888—91); Selater, Cat. Mamm., Ind. Mus., ii, p. 278 (1891).

Mustela cicognani, Bonaparte, Charlesw. Mag. N. H., ii, p. 37 (1838).

Mustela richardsoni, Bonaparte, Charlesw. Mag. N. H., ii, p. 38 (1838).

Futorius erminea, Keyserling et Blasius, Wirbelth. Europ., p. 69 (1840); Blasius, Säugeth. Deutschl., p. 228.

Putorius noveboracensis, Dekay, N. Y. Zool., p. 36, pl. xxii (1842).

Mustela fusca, Audubon et Bachman, Journ. Acad. Nat. Sci. Philad., viii, pt. 2, p. 288 (1842).

Putorius agilis, Audubon et Bachman, N. Amer. Quadr., iii, p. 184 (1853).

Putorius kanei, Baird, N. Amer. Mamm., p. 172 (1857).

Putorius (Arctogale) ermineus, Allen, Bull. Amer. Mus. Nat. Hist., xix, p. 174 (1903).

NOM. JAP. Ezo-itachi or Okojo. NOM. ANG. Ermine or Stoat.

DIST. Throughout the Palearctic region as far as the Alps and Himalayas (Blanford); Japan: N. Hondō, Hokkaidō and Saghalien.

147. *Mustela itatsi* Temm.

Putorius sibericus, Selater, Cat. Mamm. Ind. Mus., ii, 1891, p. 282 (pars).

Mustela itatsi, Temminck, Fauna Japonica, Mamm., p. 34 (1844).

Putorius itatsi, Thomas, P. Z. S., 1905, ii, p. 343.

NOM. JAP. Itachi. . . NOM. ANG. Japanese mink.

DIST. Hondō, Shikoku, Kiūshiū (Thomas), Hokkaidō: Hakodate.

148. *Mustela sibirica* Pall.

Mustela sibirica, Pallas, Spic. Zool., xiv, p. 86 (1780); Gray, List Mamm. Brit. Mus., p. 66 (1843); Blyth, Cat. no., 200, p. 68; Radde, Ost Siberiens, i, p. 45; Swinhoe, Zoologist, 1858, p. 6223; Schrenck, Amur Land, Mamm., p. 37 (1859); Gerrard, Cat. Bones Mamm., p. 94; Swinhoe, P. Z. S., 1870, p. 624.

Putorius sibericus, Hamilton-Smith, Griff. Anim. Kingd., v, p. 122 (1827); Coues, Fur-bearing Anim. N. Amer., p. 171; Selater, Cat. Mamm. Ind. Mus., ii, p. 282 (1891).

Vison sibirica, Gray, P. Z. S., 1865, p. 117.

Putorius sibiricus, Thomas, P. Z. S., 1906, ii, p. 861; *ibid.*, 1907, ii, p. 464.

Lutreola sibirica, Thomas, P. Z. S., 1908, p. 53.

NOM. ANG. Red house-stoat or mink.

DIST. Siberia generally, Amur Land (Schrenck); Japan: Tsushima (Thomas); China, Formosa (Swinhoe).

149. *Mustela vulgaris* Briss.

Mustela vulgaris, Brisson, Regn. Anim., p. 241 (1758); Erxleben, Syst. Regne Anim., p. 471 (1777); Blyth, Cat., no. 204, p. 69; Blainville Ostéogr. *Mustela*, t. 7 (skull), t. 13 (teeth); Nilsson, Skand. Fauna,

p. 163; Gerrard, Cat. Bones Mamm., p. 93; Schrenck, Amur Land, p. 41 (1859); Gray, P. Z. S., 1865, p. 113.

Mustela nivalis, Linnæus, S. N., (12), i, p. 69 (1766); Radde, Ost Siberiens, p. 53; Schrenck, Amur. Land, Mamm., p. 40 (1859); Brauns, Jena, Zeit. Zool., xvii, p. 452.

Putorius vulgaris, Hamilton-Smith, Griff. Anim. Kingd., v, p. 121 (1827); Coues, Fur-bearing Anim. N. Amer., p. 102; Sclater, Cat., Mamm. Ind. Mus., ii, p. 279 (1891).

Mustela gale, Pallas, Zool. Rosso Asiat., i, p. 94 (1834).

Factorius vulgaris, Keyserling et Blasius, Wirbelth. Europ., p. 69 (1840); Blsius, Säugeth. Deutschl., p. 231.

Mustela pusilla, Dekay, N. Y. Zool., p. 34 (1842); Blyth, Cat., no. 205, p. 69.

Putorius pusillus, Audubon et Bachman, N. Amer. Quadr., ii, p. 100 (1851).

NOM. JAP. Ko-ezo-itachi. NOM. ANG. Weasel.

DIST. N. Europe, America: northern States and Canada, Asia: Siberia, Amur region, Hakkaidō (Sclater); Kuril islands.

Gen. *Martes* Nilss.

Mustela, Linnæus, S. N., (10), 1758, p. 45 (pars); Cuvier, Règne Anim., 1817 (Subgen.); Blanford, P. Z. S., 1887, p. 636; *ibid.*, Fauna Brit. Ind. Mamm., p. 157 (1888—91).

Martes, Nilsson, Skand. Fauna, i, 1820, p. 41 (definitely constituted into gen.); Alston, P. Z. S., 1879, p. 468; Mivart, P. Z. S., 1885, p. 376; Thomas, P. Z. S., 1911, p. 138.

150. *Martes flavigula xanthospila* Swinhoe.

?*Martes chrysospila*, Swinhoe, Ann. Mag. N. H., (3), xviii, p. 286 (1866).

Martes flavigula var. *xanthospila*, Swinhoe, P. Z. S., 1870, p. 623.

Martes flavigula xanthospila, Bonhote, Ann. Mag. N. H., (7), vii, p. 347 (1901).

NOM. ANG. Yellow-necked marten.

DIST. Formosa (Swinhoe).

151. *Martes melampus melampus* (Temm.).

Mustela melampus, Temminck, Fauna Japonica, Mamm., p. 31 (1844); Thomas, P. Z. S., 1905, ii, p. 343.

Martes japonica,¹ Gray, P. Z. S., 1865, p. 104; *ibid.*, Cat. Carn. Brit. Mus., p. 82 (1869).

Martes (Melampus) melanopus, Gray, C. L. Brit. Mus., p. 63; Gerrard, Cat. Bones Mamm., p. 91.

Martes melanopus, Gray, P. Z. S., 1865, p. 105.

NOM. JAP. Ki-ten. NOM. ANG. Japanese yellow marten.

DIST. Kiūshiū (Thomas); Hondō.

152. *Martes melampus bedfordi* (Thos.).

Mustela melampus bedfordi, Thomas, Abstr. P. Z. S., no. 21, p. 10, June 13, 1905; *ibid.*, P. Z. S., 1905, ii, pp. 183, 343.

NOM. JAP. Ten. NOM. ANG. Japanese marten.

DIST. Hondō (Thomas).

153. *Martes melampus tsuensis* (Thos.).

Mustela melampus tsuensis, Thomas, Ann. Mag. N. H., (6), xix, p. 161 (1897).

Martes melampus tsuensis, Thomas, P. Z. S., 1908, p. 52.

DIST. Tsushima (Thomas).

154. *Martes zibellina* (Linn.).

Mustela zibellina, Linnæus, S. N., (10), p. 46 (1758); Radde, Ost

1) O. Thomas says:—" *Martes japonica* is the summer form of *Martes melampus*," see P. Z. S., 1905, ii, p. 335).

Siberien, i, p. 29; Schrenck, Amur Land, Mamm., p. 27 (1859); Sclater, Cat. Mamm. Ind. Mus., ii, p. 276 (1891); Allen, Bull. Amer. Mus. Nat. Hist., xix, p. 173 (1903).

?*Mustela brachyura*,¹ Temminck, Fauna Japonica, Mamm., p. 33 (1844).

Martes zibellina, Gray, P. Z. S., 1865, p. 105; *ibid.*, Cat. Carn. Brit. Mus., p. 83 (1869); Blyth, Cat., no. 195, p. 66; Thomas, P. Z. S., 1911, p. 139.

NOM. JAP. ?Ezo-ten. NOM. ANG. Sable.

DIST. N. Europe, N. Asia, Thibet, Amur region, Saghalien (Sclater); ?Hokkaidō (Schrenck).

Gen. *Gulo* Storr.

Gulo, Storr, Prodr. Meth. Mamm., p. 34 (1780); Mivart, P. Z. S., 1885, p. 381.

155. *Gulo gulo* (Linn.).

Mustela gulo, Linnæus, S. N., (10), p. 45 (1758).

Taxus gulo, Tiedemann, Zool., i, p. 377 (1808); Fischer, Syn. Mamm., p. 154; Middendorf, N. u. O. Siber., p. 4; Schrenck, Amur Land, Mamm., p. 24 (1859).

Gulo borealis, Nilsson, Skand. Fauna, p. 139 (1829); Gray, P. Z. S., 1865, p. 120.

Gulo luscus, Sclater, Cat. Mamm. Ind. Mus., ii, 1891, p. 283 (pars, nec *Ursus luscus* Linn.)

NOM. ANG. Glutton or Wolverine.

DIST. Northern parts of Europe and Asia, Saghalien (Schrenck).

1) L. Schrenck says:—" *Mustela brachyura* of Temminck is either identical or short tailed variety of *Martes zibellina*" (see Amur Land).

Sub-Fam. *Melinæ*.Gen. *Meles* Storr.

Meles, Storr, Prodr. Meth. Mamm., p. 34 (1780).

156. *Meles anakuma* Temm.

Meles anakuma, Temminck, Fauna Japonica, Mamm., p. 30 (1844) ; Thomas, P. Z. S., 1905, ii, p. 344.

Meles ankuma (misprint), Gray, P. Z. S., 1853, p. 191 ; *ibid.*, 1865, p. 140 ; Gerrard, Cat. Bones Mamm., p. 99.

Meles taxus var., Middendorf, N. u. O. Siber.

NOM. JAP. Anaguma. NOM. ANG. Japanese badger.

DIST. Shikoku, Kiūshiū (Thomas) ; Hondō, Hokkaidō.

Gen. *Helictis* Gray.

Helictis, Gray, P. Z. S., 1831, p. 94.

Melogale, Geoffroy, Voy. aux Indes Orient. Belanger, p. 129 (1834).

157. *Helictis subaurantiaca* Swinhoe.

Helictis subaurantiaca, Swinhoe, P. Z. S., 1862, p. 355 ; Gray, *ibid.*, 1865, p. 153 ; *ibid.*, Cat. Carn. Brit. Mus., p. 142 (1869) ; Swinhoe, P. Z. S., 1870, p. 623.

NOM. ANG. Orange-tinted tree-civet.

DIST. Formosa (Swinhoe).

Sub-Fam. *Lutrinæ*.Gen. *Lutra* Erxl.

Lutra, Erxleben, Syst. Règne Anim., p. 445 (1777) ; Mivart, P. Z. S., 1885, p. 383 ; Blanford, Fauna Brit. Ind. Mamm., p. 181 (1888—91) ; Sclater, Cat. Mamm. Ind. Mus., ii, p. 291 (1891).

Aonyx, Lesson, Monogr. Mamm., p. 157 (1827).

Lataxina, Gray, List Mamm. Brit. Mus., p. 70 (1843).

Barangia, Gray, P. Z. S., 1865, p. 123.

158. *Lutra lutra lutra*¹ (Linn.).

Mustela lutra, Linnæus, S. N., (10), p. 45 (1758).

Lutra vulgaris, Erxleben, Syst. Règne Anim., p. 448 (1777); Keyserling et Blasius, Wirbelth. Europ., p. 121 (1840); Gray, List Mamm. Brit. Mus., p. 70 (1843); Temminck, Fauna Japonica, Mamm. p. 35 (1844); Nilsson, Skand. Fauna, p. 175; Bell, Brit. Quadrup., p. 129; Owen, Brit. Foss. Mamm., p. 119; *ibid.*, Odont., p. 128; Blainville, Osteogr. *Mustela*, pp. 5, 8, 13; Middendorf, Siberische Reise, ii, pt. ii, p. 70; Schrenck, Amur Land, Mamm., p. 42 (1859); Radde, Ost Siberien, i, p. 54; Kelaart, Prodr. Fauna Zeylan., p. 35; Blyth, Cat., no. 216, p. 73; Jerdon, Mamm., p. 88; Gray, P. Z. S., 1865, p. 126; *ibid.*, Cat. Carn. Brit. Mus., p. 103 (1869); Gerrard, Cat. Bones Mamm., p. 100; Severtzoff, Ann. Mag. N. H., (4), xviii, p. 48 (1876); Blanford, Persia, p. 43; *ibid.*, J. A. S. B., xlv, p. 324; Danford, P. Z. S., 1877, p. 275; Alston, P. Z. S., 1877, p. 275; *ibid.*, 1880, p. 54; Lydekker, J. A. S. B., xlix, p. 6; Scully, P. Z. S., 1881, p. 203; *ibid.*, Ann. Mag. N. H., (5), viii, p. 97 (1881); Blanford, Fauna Brit. Ind. Mamm., p. 182 (1888—91); Thomas, P. Z. S., 1889, p. 195; Sclater, Cat. Mamm. Ind. Mus., ii, p. 292 (1891); Radde, Zool. J. B., iv, p. 1022; Flower, P. Z. S., 1900, p. 334.

Lutronektes whiteleyi,² Grey, P. Z. S., 1867, p. 181; *ibid.*, Cat. Carn. Brit. Mus., p. 107 (1869); Thomas, P. Z. S., 1905, ii, p. 335.

NOM. JAP. Kawauso. NOM. ANG. Common otter.

1) Other synonyms of *Lutra lutra lutra* are as follows (Sclater):—

Viverra lutra Pallas, 1831; *Lutra roensis* Ogilby, 1834; *Lutra nudipes* Melchior, 1834; *Lutra indica* Gray, 1837; *Lutra monticolus* Hodgson, 1839; *Lutra monticola* Blyth, 1842; *Lutra kutab* Schinz, 1844.

2) O. Thomas says: "This new genus and species was based on young specimens of the Japanese otter."

DIST. The typical variety is found throughout the Palearctic region from England to Japan, it extends in the Himalayas from Gilgit to the Brahmapootra, at elevations of from 4,000 to 12,000 ft. (Sclater).

159. *Lutra lutra chinensis* Gray.

Lutra chinensis, Gray, Charlesw. Mag. N. H., 1837, p. 580; *ibid.*, List Mamm. Brit. Mus., p. 71 (1843); Tyler, Ann. Mag. N. H., 1854, p. 772; Horsfield, *ibid.*, 1855, xvi, p. 109; Tyler, P. Z. S., 1861, p. 399; Gray, *ibid.*, 1865, p. 126; *ibid.*, Cat. Carn. Brit. Mus., p. 104 (1869); Swinhoe, P. Z. S., 1870, p. 624; Anderson, Anat. Zool. Res., p. 211 (1878).

Lutra nair, Swinhoe (nec Cuv.), P. Z. S., 1861, p. 390.

DIST. S. China, Formosa (Swinhoe).

Gen. *Enhydra* Fleming.

Enhydra, Fleming, Philos. Zool., ii, p. 187 (1822).

160. *Enhydra lutris* (Linn.).

Mustela lutris, Linnæus, S. N., (10), p. 45 (1758).

Lutra marina, Erxleben, Syst. Règne Anim., p. 445 (1777).

Pusa orientalis, Oken, Lehrb. Naturg., iii, p. 986 (1816).

Lutra lutris, Lesson, Monogr. Mamm., p. 155 (1827).

Lutra stelleri, Lesson, Monogr. Mamm., p. 156 (1827).

Enhydriis stelleri, Fischer, Syn. Mamm., p. 229 (1829).

Phoca lutris, Pallas, Zool. Rosso Asiat., p. 100 (1831).

Latax marina, Lesson, Nouv. Tabl. Regn. Anim., p. 71 (1842).

Enhydra lutris, Dekay, N. Y. Zool., p. 41 (1842); Coues, Fur-bearing Anim. N. Amer., p. 326; Sclater, Cat. Mamm. Ind. Mus., ii, p. 297 (1891).

Enydriis marina, Temminck, Fauna Japonica, Mamm., p. 35 (1844).

Enhydriis marina, Hempr., Licht. Darst. Säugeth., t., p. 19; Evers-

man, Reise um die Erde, t., pp. 11, 12; Schrenck, Amur Land, Mamm., p. 43 (1859); Gray, P. Z. S., 1865, p. 136; *ibid.*, Cat. Carn. Brit. Mus., p. 119 (1869).

Latax lutris, Thomas, P. Z. S., 1911, p. 138.

NON. JAP. Rakko. NOM. ANG. Sea-otter.

DIST. Shores of N. Pacific, north of 50°, extending on the American side as far south as Lower California (Sclater).

Trunk CARNIVORA PINNIPEDIA.

Fam. OTARIIDÆ.

Gen. *Eumetopias* Gill.

Eumetopias Gill, Proc. Essex Inst., v, 7, p. 11 (1866).

161. *Eumetopias stelleri* (Lesson).

Otaria stelleri, Lesson, Dict. Class. Hist. Nat., xiii, p. 420 (1828); Temminck, Fauna Japonica, Mamm.-Marins, p. 10 (1844).

Eumetopias stelleri, Gray, Ann. Mag. N. H., (3), xviii, p. 233 (1866).

NOM. JAP. Ashika. NOM. ANG. Stellar's sea-lion.

Gen. *Callorhinus* Gray.

Callorhinus, Gray, P. Z. S., 1859, p. 359.

162. *Callorhinus ursinus* (Linn.).

Phoca ursina, Linnæus, S. N., (10), p. 37 (1758).

Otaria ursina, Schrenck, Amur Land, Mamm., p. 189 (1859).

Callorhinus ursinus, Gray, P. Z. S., 1859, p. 359; Günther, *ibid.*, 1880, p. 443; Thomas, *ibid.*, 1911, p. 133.

NOM. JAP. Ottosei. NOM. ANG. Northern fur-seal or sea-bear.

Fam. ODOBENIDÆ.

Gen. *Odobenus* Briss.

Odobenus, Brisson, Regn. Anim., 1758.

Trichechus, Linnæus, S. N., (12), i, p. 48 (1766).

163. *Odobenus rosmarus* (Linn.).

Phoca rosmarus, Linnæus, S. N., (10), p. 38 (1758).

Trichechus rosmarus, Linnæus, S. N., (12), i, p. 49 (1766); Schrenck, Amur Land, Mamm., p. 179 (1859).

Odobænus rosmarus, Malmgren, Ofver. K. Vet. Akad. Forh., 1863 (1864), pp. 130, 505.

Odobenus rosmarus, Thomas, P. Z. S., 1911, p. 134.

NOM. JAP. Seiuchi. NOM. ANG. Atlantic walrus.

Fam. PHOCIDÆ.

Gen. *Phoca* Linn.

Phoca, Linnæus, S. N., (10), p. 37 (1758).

164. *Phoca vitulina* Linn.

Phoca vitulina, Linnæus, S. N., (10), p. 38 (1758).

Phoca nummularis, Temminck, Fauna Japonia, Mamm.-Marins, p. 13 (1844); Schrenck, Amur Land, Mamm., p. 180 (1859).

NOM. JAP. Azarashi. NOM. ANG. Harbor-seal.

Ord. CETACEA.

Sub-Ord. MYSTACOCETI.

Fam. BALÆNIDÆ.

Gen. *Balæna* Linn.

Balæna, Linnæus, S. N., (10), p. 75 (1758).

165. *Balæna australis* Desmoulius.

Balæna australis, Desmoulius, Dict. Class. H. N., ii, p. 161 (1822); Blyth, J. A. S. B., xxviii, p. 488; *ibid.*, Cat., no. 290, p. 94; Schrenck, Amur Land, Mamm., p. 193, (1859); Flower, P. Z. S., 1864, p. 390; *ibid.*, List Cetacea Brit. Mus., p. 1.

NOM. JAP. Semi-kuzira. NOM. ANG. Southern right-whale.

Fam. RHACHIANECTIDÆ.

Gen. *Rhachianectes* Cope.

Rhachianectes, Cope, Proc. Acad. Nat. Sci. Philad., 1869, p. 14.

166. *Rhachianectes glaucus* Cope.

Rhachianectes glaucus, Cope, Proc. Acad. Nat. Sci. Philad., 1869, pp. 17, 40.

NOM. JAP. Ko-kuzira. NOM. ANG. Californian gray whale.

Fam. BALÆNOPTERIDÆ.

Gen. *Megaptera* Gray.

Megaptera, Gray, Zool. Erebus and Terror, p. 16 (1846).

167. Megaptera longimana Rudolphi.

Megaptera longimana, Rudolphi, Abh. Ak. Berlin, 1829, p. 133 ; True, P. U. S. Nat. Mus., xxi, no. 1163, p. 635 (1898).

Balæna antarctica, Temminck, Fauna Japonica, Mamm.-Marins, p. 18 (1844).

Balænoptera longimana, Schrenck, Amur Land, Mamm., p. 192 (1859).

Megaptera kuzira, Swinhoe, P. Z. S., 1870, p. 652.

NOM. JAP. Zatō-kuzira. NOM. ANG. Humpback-whale.

Gen. *Balænoptera* Lacépède.

Balænoptera Lacépède, Hist. Nat. Cétécées, p. xxxvi, (1804) ; Blanford, Fauna Brit. Ind. Mamm., p. 566 (1888—91).

168. Balænoptera musculus (Linn.).

Balæna musculus, Linnæus, S. N., (10), p. 76 (1758).

Balænoptera sibbaldii, Gray, P. Z. S., 1847, p. 92 ; Reinhardt, Ann. Mag. N. H., (4), ii, p. 323 (1868).

Balænoptera musculus, True, P. U. S. Nat. Mus., xxi, no. 1163, p. 629 (1898) ; Thomas, P. Z. S., 1911, p. 156.

NOM. JAP. ?Iwashi-kuzira. NOM. ANG. Sibbald's rorqual.

169. Balænoptera swinhoii Gray.

Balænoptera swinhoii, Gray, P. Z. S., 1865, p. 725 ; ibid., Ann. Mag. N. H., (3), xvi, p. 146 (1865) ; Swinhoe, P. Z. S., 1870, pp. 231, 652.

NOM. ANG. Swinhoe's fin-whale.

Gen. *Sibbaldius* Flower.

Sibbaldius, Flower, P. Z. S., 1864, p. 392.

170. *Sibbaldius sulphureus* (Cope).

Sibbaldius sulphureus, Cope, Proc. Acad. Nat. Sci. Philad., 1869, pp. 10, 19.

NOM. JAP. Nagasu-kuzira. NOM. ANG. Sulphur-bottom whale.

Sub-Ord. ODONTOCETI.

Fam. PHYSETERIDÆ.

Sub-Fam. Physeterinae.

Gen. *Physeter* Linn.

Physeter, Linnæus, S. N., (10), p. 76 (1858); Blanford, Fauna Brit. Ind. Mamm., p. 570 (1888—91).

171. *Physeter macrocephalus* Linn.

Physeter macrocephalus, Linnæus, S. N., (10), p. 76 (1758); Blyth, J. A. S. B., xxix, p. 452; *ibid.*, Cat. no. 287, p. 93; Flower, Trans. Zool. Soc., vi, p. 309, pls. lv, lvi; *ibid.*, List Cetacea Brit. Mus., p. 8; Blanford, Fauna Brit. Ind. Mamm., p. 571 (1888—91); Sclater, Cat. Mamm. Ind. Mus., p. 314 (1891); Thomas, P. Z. S., 1911, p. 157.

NOM. JAP. Makkō-kuzira. NOM. ANG. Cachalot or Sperm-whale.

Sub-Fam. Ziphiinae.

Gen. *Ziphius* Cuv.

Ziphius, Cuvier, Ossements Foss., 2nd ed., v, p. 352 (1823).

172. *Ziphius cavirostris* Cuv.

Ziphius cavirostris, Cuvier, Ossements Foss., 2nd ed., v, p. 352 (1823).

NOM. JAP. ?Akabō-kuzira.

Gen. *Berardius* Duvernoy.

Berardius, Duvernoy, Ann. Sci. Nat., (3), Zool., xv, p. 41 (1851).

173. *Berardius bairdii* Stejneger.

Berardius bairdii, Stejneger, P. U. S. Nat. Mus., vi, p. 75 (1883).

NOM. JAP. Tsuchi-kuzira.

Fam. DELPHINIDÆ.

Sub-Fam. Phocæninæ.

Gen. *Phocæna* Cuv.

Phocæna, Cuvier, Règne Anim., i, p. 279 (1817); Flower, P. Z. S., 1883, p. 505; Blanford, Fauna Brit. Ind. Mamm., p. 574 (1888—91).

174. *Phocæna phocæna* (Linn.).

Delphinus phocæna, Linnaeus, S. N., (10), p. 77 (1758).

Phocæna communis, Lesson, Monogr. Mamm., p. 413 (1827); Blyth, Cat. r. 271, p. 88; Flower, P. Z. S., 1883, p. 505; *ibid.*, List Cetacea Brit. Mus., p. 15; Sclater, Cat. Mamm. Ind. Mus., ii, p. 317 (1891).

NOM. JAP. Nezumi-iruka. NOM. ANG. Harbor-porpoise.

175. *Phocæna phocænoides* Cuv.

Phocæna phocænoides, Cuvier, Règne Anim., i, p. 291 (1817); Blanford, Fauna Brit. Ind. Mamm., p. 574 (1888—91).

Delphinus melas, Temminck, Fauna Japonica, Mamm.-Marins, 1844, p. 14 (nec Traill, 1809.)

NOM. JAP. Sunameri. NOM. ANG. Little Indian porpoise.

Gen. *Phocænoides* Andrews.

Phocænoides, Andrews, Bull. Amer. Mus. Nat. Hist., xxx, p. 31 (1911).

176. *Phocænoides truei* Andrews.

Phocænoides truei, Andrews, Bull. Amer. Mus. Nat. Hist., xxx, p. 32 (1911).

Sub-Fam. Delphininæ.

Gen. *Globicephalus* Lesson.

Globicephalus, Lesson, Tabl. Regn. Anim., p. 200 (1842); Gray, Zool. Erebus and Terror, p. 32 (1846); Blanford, Fauna Brit. Ind. Mamm., p. 577 (1888—91).

Globiceps, Flower, P. S. Z., 1883, p. 508.

177. *Globicephalus melas* (Traill).

Delphinus melas, Traill, Nichol. Journ., xxii, p. 81 (1809).

Delphinus globiceps, Cuvier, Ann. Mus. Paris., xix, p. 14, pl. 1 (1812); Temminck, Fauna Japonica, Mamm.-Marins, p. 17 (1844).

Globicephalus svinval, Gray, Zool. Erebus and Terror, p. 32 (1846).

Globicephalus deductor, Blyth, Cat., no. 273, p. 89 (1863).

Globicephalus melas, Flower, List Cetacea Brit. Mus., p. 19 (1885); Sclater, Cat. Mamm. Ind. Mus., ii, p. 319 (1891).

178. *Globicephalus sieboldii* Gray.

Delphinus globiceps, Temminck, Fauna Japonica, Mamm.-Marins, t. 27 (young).

Globicephalus sieboldii, Gray, Zool. Erebus and Terror, p. 32 (1846); Gray, Cat. Cetacea Brit. Mus., p. 90 (1850).

NOM. JAP. Gondō-kuzira. NOM. ANG. Pilot-whale.

Gen. *Orca* Gray.

Orca, Gray, Zool. Erebus and Terror, p. 33 (1846).

179. Orca orca (Linn.).

Delphinus orca, Linnæus, S. N., (10), p. 77 (1758).

Delphinus gladiator, Bonnaterre, Cét., pp. 22, 23 (1789); Lacépède, Hist. Nat. Cétacées, p. 302 (1804).

Grampus sakamata, Gray, Zool. Erebus and Terror, p. 31 (1846).

NOM. JAP. Sakamata or Shachi. NOM. ANG. Killer or Grampus.

Gen. *Grampus* Gray.

Grampus, Gray, Zool. Erebus and Terror, p. 30 (1846); Flower, P. Z. S., 1883, p. 510.

180. Grampus griseus (Cuv.).

Delphinus griseus, Cuvier, Ann. Mus. Paris, xix, p. 14 (1812).

Grampus sakamata, Gervais, Ostéographie Cétacés (1880).

NOM. ANG. Risso's dolphin.

Gen. *Lagenorhynchus* Gray.

Lagenorhynchus, Gray, Zool. Erebus and Terror, p. 35 (1846); Flower, P. Z. S., 1883, p. 489; Blanford, Fauna. Brit. Ind. Mamm., p. 579 (1888—91).

181. Lagenorhynchus acutus (Gray).

Delphinus acutus, Gray, Spic. Zool., i, p. 2 (1828).

Delphiuus eschrichtii, Schlegel, Abhan. Gebiet. Zool., i, p. 23, pls. i, ii, fig. 4, iv, fig. 5 (1841).

Delphinus leucopleurus, Rasch, Nyt. Mag. Naturvidens, iv, p. 97, pls. ii, iii (1843).

Lagenorhynchus leucopleurus, Gray, Zool. Erebus and Terror, p. 34 (1846); Blyth, Cat., no. 281, p. 91.

Leucopleurus arcticus, Gray, Supp. Cat. Seals and Whales, p. 78 (1871).

Lagenorhynchus acutus, Flower, P. Z. S., 1883, p. 511; *ibid.*, List Cetacea Brit. Mus., p. 23 (1885); Sclater, Cat. Mamm. Ind. Mus., p. 321 (1891).

NOM. JAP. Kama-iruka. NOM. ANG. Bay-porpoise.

Gen. *Prodelphinus* van Beneden et Gervais.

Prodelphinus van Beneden et Gervais, Ostéographie Cétacés, p. 604 (1880).

182. *Prodelphinus longirostris* (Gray).

Delphinus longirostris, Gray, Spic. Zool., i, p. 1 (1828); Cuvier, Regn. Anim., 2nd ed., p. 228 (1829); Temminck, Fauna Japonica, Mamm.-Marins, p. 13 (1844).

Prodelphinus longirostris, van Beneden et Gervais, Ostéographie Cétacés, p. 604 (1880).

NOM. JAP. Ma-iruka. NOM. ANG. Cape-dolphin.

Ord. ARTIODACTYLA.

Sub-Ord. NONRUMINANTIA.

Fam. SUIDÆ.

Sub-Fam. Suinæ.

Gen. *Sus*¹ Linn.

Sus, Linnæus, S. N., (10), p. 49 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 559 (1888—91).

183. *Sus leucomystax* Temm.

Sus leucomystax, Temminck, Fauna Japonica, Mamm., p. 57 (1845); Swinhoe, P. Z. S., 1870, pp. 236, 639; Thomas, *ibid.*, 1905, ii, p. 357.

1) Synonymous with *Porcula* Hodgson, 1847 (Blanford).

NOM. JAP. Inoshishi. NOM. ANG. White-moustached boar.

DIST. Hondō (Thomas); Shikoku, Kiūshiū (Matsubara); Formosa (Swinhoe).

184. *Sus taivanus* (Swinhoe).

Porcula taivana, Swinhoe, P. Z. S., 1862, p. 360.

Sus taivanus, Swinhoe, P. Z. S., 1864, p. 383; Gray, *ibid.*, 1868, p. 26; Swinhoe, *ibid.*, 1870, p. 641.

Sus taivana, Gray, P. Z. S., 1867, p. 240.

NOM. JAP. Taiwan-inoshishi. NOM. ANG. Formosan wild-boar.

DIST. Formosa (Swinhoe).

185. *Sus* sp.

Sus sp., Matsubara, Zool. Mag., Tokyo, i, p. 93 (1889); Bangs, Amer. Nat. xxxv, no. 415, p. 561 (1901).

DIST. Liūkiū: Ishigaki I. (Bangs).

Sup. Sub-Ord. RUMINANTIA.

Sub-Ord. PECORA.

Fam. CERVIDÆ.

Sub-Fam. Cervinæ.

Gen. *Cervus* Linn.

Cervus, Linnæus, S. N., (10), p. 66 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 534 (1888—91).

Sub-Gen. *Rusa* Ham.-Smith.

Rusa, Hamilton-Smith, Griff. Anim. Kingd., v, p. 309 (1827).

186. *Cervus swinhoii* (Sclater).

Rusa swinhoii, Sclater, P. L., P. Z. S., 1862, p. 152; Swinhoe, *ibid.*, p. 364; Sclater, P. L., Trans. Zool. Soc., vii, p. 349 (1871).

Cervus swinhoii, Swinhoe, P. Z. S., 1870, p. 646; Brooke, *ibid.*, 1878, p. 901; Sclater, Cat. Mamm. Ind. Mus., ii, p. 178 (1891).

NOM. JAP. Swinhoe-shika or Suiroku. NOM. ANG. Swinhoe's deer.
DIST. Formosa (Swinhoe).

187. *Cervus unicolor*¹ Bechstein.

Cervus unicolor et *albicornis*, Bechstein, Allgem. Uebers. vierfüß. Thiere, i, p. 112 (1799).

Cervus unicolor, Blanford, Fauna Brit. Ind. Mamm., p. 543 (1888—91).

Cervus unicolor boninensis,² Lydekker, Ann. Mag. N. H., (7), xv, p. 391 (1905).

NOM. ANG. Sambur.

DIST. India, Ceylon, Assam, Burma, Siam, Hainan, Malay peninsula, probably also parts of China, Formosa, Philippines, Borneo and Sumatra (Flower); Bonin Islands (Lydekker).

Sub-Gen. *Pseudaxis* Gray.

Pseudaxis, Gray, Cat. Rum. Brit. Mus., p. 70 (1872); Brooke, P. Z. S., 1878, p. 907.

188. *Cervus sika*³ Temm.

Cervus sika, Temminck, Fauna Japonica, Mamm., p. 54 (1845); Sclater, P. L., P. Z. S., 1860, p. 377; *ibid.*, Trans. Zool. Soc., vii,

1) Other synonyms of *Cervus unicolor* are as follows (Blanford):—

Cervus niger Blainville, 1816; *Cervus leschenaultii* Cuvier, 1825; *Cervus jarai* Hodgson, 1831; *Rusa jaraya, nepalensis* et *heterocervus* Hodgson, 1841; *Axis pennantii* Gray, 1843.

2) Introduced into Bonin Islands by Perry, about 60 years ago.

3) Other synonyms of *Cervus sika* are as follows (Lydekker):—

Rusa japonica Gray, 1860; *Pseudaxis sika* Gray, 1872; *Cervus euopsis* Swinhoe, 1874.

p. 346; Brooke, P. Z. S., 1878, p. 908; Sclater, P. L., List Anim. Zool. Gardens, p. 164 (1883); Powerscourt, P. Z. S., 1884, p. 207; Sclater, Cat. Mamm. Ind. Mus., p. 183 (1891); Sclater, P. L., List Anim. Zool. Gardens, p. 175 (1896); Mivart, P. Z. S., 1897, p. 294; Lydekker, *ibid.*, p. 39; Thomas, *ibid.*, 1908, p. 54.

Cervus sp., Thomas, Ann. Mag. N. H., (7), xvii, p. 89.

NOM. JAP. Shika. NOM. ANG. Japanese deer.

DIST. Hondō, Shikoku, Kiūshiū, Hokkaidō, N. China (Lydekker), Liūkiū.

189. *Cervus taiouanus*¹ Blyth.

Cervus taiouanus, Blyth, J. A. S. B., xxix, p. 90 (1860); Sclater, P. L., P. Z. S., 1860, p. 376.

Cervus taiwanus, Sclater, P. L., P. Z. S., 1862, p. 152; Swinhoe, *ibid.*, p. 362; Sclater, P. L., Trans. Zool. Soc., vii, p. 345 (1871); Brooke, P. Z. S., 1878, p. 909; Sclater, Cat. Mamm. Ind. Mus., ii, p. 183 (1891); Lydekker, P. Z. S., 1897, p. 45.

NOM. JAP. Kwaroku. NOM. ANG. Formosan deer.

DIST. Formosa (Lydekker).

Gen. *Rangifer* Ham.-Smith.

Rangifer, Hamilton-Smith, Griff. Anim. Kingd., v, (1827), p. 304 (Subgen.); Brooke, P. Z. S., 1878, p. 927.

190. *Rangifer tarandus* (Linn.).

Cervus tarandus, Linnæus, S. N., (10), p. 67 (1758); Temminck, Fauna Japonica, Mamm., p. 54 (1845).

Cervus (Rangifer) tarandus, Hamilton-Smith, Griff. Anim. Kingd., iv, p. 79 (1827).

1) Other synonyms of *Cervus taiouanus* are as follows (Lydekker):—
Cervus pseudaxis Swinhoe, 1870; *Pseudaxis taiwanus* Gray, 1872.

Tarandus rangifer, Ogilby, P. Z. S., 1836, p. 134; Blyth, Cat., p. 145.

Rangifer tarandus, Gray, List Mamm. Brit. Mus. p. 181 (1843); Schrenck., Amur Land, Mamm., p. 167 (1859); Brooke, P. Z. S., 1878, p. 928; Sclater, Cat. Mamm. Ind. Mus., ii, p. 188 (1891); Allen, Bull. Amer. Mus. Nat. Hist., xix, p. 125 (1903); Thomas, P. Z. S., 1911, p. 151.

Rangifer caribou et groenlandicus, Baird, N. Amer. Mamm., p. 633 (1857).

NOM. JAP. Junroku or Tonakai. NOM. ANG. Reindeer.

DIST. Circumpolar, i.e. N. Europe, Asia and America (Sclater); Japan: Saghalien (Schrenck).

Gen. *Cervulus*¹ Blainv.

Cervulus, De Blainville, Bull. Soc. Philom., p. 74 (1816); Brooke, P. Z. S., 1874, p. 38; Blanford, Fauna Brit. Ind. Mamm., p. 531 (1888—91).

191. *Cervulus reevesi* Ogilby.

Cervulus reevesi, Ogilby, P. Z. S., 1838, p. 105; Blyth, J. A. S. B., xxix, p. 93 (1860); Swinhoe, P. Z. S., 1862, p. 361; Blyth, Cat., p. 155; Swinhoe, P. Z. S., 1870, p. 644; Gray, Cat. Rum. Brit. Mus., p. 165 (1872); Brooke, P. Z. S., 1874, p. 41; Sclater, *ibid.*, 1875, p. 422; Brooke, *ibid.*, 1878, p. 899; Sclater, Cat. Mamm. Ind. Mus., ii, p. 174 (1891).

Cervulus micrurus, Sclater, P. Z. S., 1875, p. 421.

NOM. JAP. Kyong. NOM. ANG. Reeve's muntjac.

DIST. S. China from Canton northwards to Ningpo and Formosa (Sclater).

1) Other synonyms of Gen. *Cervulus* are as follows (Blanford):—

Stylloceros (Subgen.) Smith, 1827; *Prox* Ogilby, 1836; *Muntjacus* Gray, 1843.

Sub-Fam. Moschinae.

Gen. *Moschus* Linn.

Moschus, Linnæus, S. N., (10), p. 66 (1758); Blanford, Fauna Brit. Ind. Mamm., p. 551 (1888—91).

192. *Moschus moschiferus* Linn.

Moschus moschiferus, Linnæus, S. N., (10), p. 66 (1758); Hodgson, Gleanings in Science, iii, p. 320; Pallas, Zool. Rosso Asiat., p. 198; Walker, Calc. Journ. N. H., iii, p. 267; Wagner, Hugel's Kaschmir, iv, p. 576; Middendorf, Siberische Reise, p. 118; Hutton, J. A. S. B., vi, p. 935; Hodgson, *ibid.*, xvi, p. 693; *ibid.*, xvii, p. 486; Adams, P. Z. S., 1858, p. 528; Schrenck, Amur Land, Mamm., p. 161 (1859); Radde, Ost Siberien, p. 274; Blyth, Cat., p. 157; Milne-Edwards, Ann. Sci. Nat., (5), ii, p. 154; Jerdon, Mamm., p. 266; Kinloch, Large Game Shooting, i, p. 41; Milne-Edwards, Rech. Mamm., p. 176; Blanford, J. A. S. B., xli, p. 39; Flower, P. Z. S., 1875, p. 159; Lydekker, J. A. S. B., xlvii, p. 286; *ibid.*, xlix, p. 4; Scully, P. Z. S., 1881, p. 209; Blanford, Fauna Brit. Ind. Mamm., p. 552 (1888—91); Sclater, Cat. Mamm. Ind. Mus., ii, p. 172 (1891); Allen, Bull. Amer. Mus. Nat. Hist., xix, p. 129 (1903); Thomas, P. Z. S., 1911, p. 150.

Moschus sibiricus, Pallas, Spic. Zool., xiii, p. 29 (1779).

Moschus altaicus, Eschscholtz, Isis, p. 606 (1830).

Moschus chrysogaster, *leucogaster* et *saturatus*, Hodgson, J. A. S. B., viii, p. 203 (1839); *ibid.*, xi, p. 285.

NOM. JAP. Jiakō-shika. NOM. ANG. Musk-deer.

DIST. Throughout the Himalayas as far west as Gilgit, at elevations exceeding 8000 ft. (in Sikhim in the summer above 12,000), in forest and frushwood. Also in Thibet and other parts of Central Asia as far north as Siberia (Blanford). Saghalien (Schrenck).

Fam. EOVIDÆ.

Sub-Fam. Rupicaprinæ.

Gen. *Nemorhædus* Ham.-Smith.

Nemorhædus, Hamilton-Smith, Griff. Anim. Kingd., v, p. 352 (1827);
Blanford, Fauna Brit. Ind. Mamm., p. 512 (1888—91).

Kemas, Ogilby, P. Z. S., p. 138 (1836).

Capricornis, Ogilby, P. Z. S., p. 139 (1836).

Urotragus, Gray, Ann. Mag. N. H., (4), viii, p. 371 (1871).

193. *Nemorhædus crispus* (Temm.).

Antilope crista, Temminck, Fauna japonica, Mamm., p. 55 (1845).

Nemorhædus crispus, Thomas, P. Z. S., 1905, ii, p. 357.

NOM. JAP. Kamo-shika, Niku or Kura-shishi. NOM. ANG.
Japanese goat-antelope.

DIST. Honō (Thomas).

194. *Nemorhædus sumatrensis* (Shaw).

Antilope sumatrensis, Shaw, Genl. Zool., ii, pt. 2, p. 354 (1800);
Raffles, Trans. Linn. Soc. xiii, p. 266; Ogilby, P. Z. S., 1836, p. 121;
Muller, Over de Zoogdieren Tem. Verhandl., p. 45.

Antilope (Nemorhædus) sumatrensis, Hamilton-Smith, Griff. Anim.
Kingd., iv, p. 277 (1827).

Nemorhædus sumatrensis, Gray, List Mamm. Brit. Mus., p. 166
(1843); Beavan, P. Z. S., 1866, p. 2; Cantor, J. A. S. B., xv, p. 272;
Sclater, Cat. Mamm. Ind. Mus., ii, p. 150 (1891).

Capricornis sumatrensis, Gray, P. Z. S., p. 135 (1850); Blyth, Cat.,
p. 174; *ibid.*, J. A. S. B., xlv, Burma List, p. 46.

Capricornis swinhoii, Gray, P. Z. S., 1862, p. 263; Swinhoe, *ibid.*,
p. 361; *ibid.*, 1870, p. 647.

Capricornis rubida, Blyth, Cat., p. 174 (1863).

Antilope interscapularis, Lichtenstein, Mag. Ges. Naturf. Freunde, vi, p. 165 (1864).

?*Capricornis milne-edwardsii*, David, N. Arch. Mus., v, bull. p. 10 (1869).

Antilope (Nemorhædus) edwardsii, Milne-Edwards, Rech. Mamm., p. 374 (1874); Anderson, Anat. Zool. Res., p. 335.

DIST. Assam, Burma, Arakan, Moulmein, Tenasserim, Malay peninsula, and Sumatra; also Formosa. If *Nemorhædus edwardsii* is identical with this species, the range extends northwards to E. Thibet (Sclater).

Ord. SIRENIA.

Fam. *Halicoridæ*.

Gen. *Helicore* Illiger.

Helicore, Illiger, Prodr. Syst. Mamm. et Avium, p. 140 (1811); Blanford, Fauna Brit. Ind. Mamm., p. 593 (1888—91).

195. *Halicore dugong* (Erxl.).

Trichechus dugung, Erxleben, Syst. Règne Anim., p. 599 (1777).

Helicore dugong, Illiger, Prodr. Syst. Mamm. et Avium, p. 140 (1811); Gray, Hardwicker's Ill. Ind. Zool., ii, pl. xxiii; Horsfield, Cat. E. Ind. Mus., p. 139; Blyth, J. A. S. B., xxviii, pp. 271, 483, 494; *ibid.*, Cat., no. 461, p. 143; *ibid.*, Mamm. Birds Burma, p. 53; Jerdon, Mamm., no. 240, p. 311; Blyth, J. A. S. B., xlv, Burma List, p. 53; Nevill, Taprobanian, i, p. 2; Matsubara, Zool. Mag., Tokyo, i, p. 129 (1889); Sclater, Cat. Mamm. Ind. Mus., ii, p. 326 (1891); Flower, P. Z. S., 1900, p. 377.

Helicore indicus, Desmarest, Mamm., p. 509 (1822); Cantor, J. A. S. B., xv, p. 274; Kelaart, Prodr. Fauna Zeylan., p. 89; Blyth, J. A. S. B., xxviii, p. 494.

Halicore tabernaculi, Rüppell et Sömmerring, Mus. Senckenb., i, p. 99, pl. vi (1834).

NOM. JAP. Zannoio. NOM. ANG. Dugong or Duyong.

DIST. Shore of the Indian Ocean, Straits of Malacca, and coasts of Borneo (Flower); Liūkiū, Amami-ōshima (Matsubara).

Ord. SIMIÆ.

Sub-Ord. CATARRHINA.

Fam. CERCOPITHECIDÆ.

Sub-Fam. Cercopithecinae.

Gen. *Macacus*¹ Lacépède.

Macacus, Lacépède, Mém. de Institut, iii, p. 450 (1801); Blanford, Fauna Brit. Ind. Mamm., p. 11 (1888—91).

196. *Macacus cyclopis* Swinhoe.

Macacus cyclopis, Swinhoe, P. Z. S., 1862, p. 350; *ibid.*, 1864, p. 380; Sclater, *ibid.*, p. 711; Swinhoe, *ibid.*, 1870, p. 615; Murie, *ibid.*, 1872, p. 771.

NOM. ANG. Formosan rock-monkey.

DIST. Formosa (Swinhoe).

197. *Macacus fuscatus* Blyth.

Imus speciosus, Temminck, Fauna Japonica, Mamm., 1842, p. 9 (nec Cuv.).

Macacus fuscatus, Blyth, J. A. S. B., xlv, extra number, p. 6 (1785); Thomas, 1905, ii, p. 336.

NOM. JAP. Saru. NOM. ANG. Japanese monkey.

DIST. Hondō, Shikoku, Kiūshiū.

1) Other synonyms of Gen. *Macacus* are as follows (Blanford):—
Imus Cuvier; *Silenus* Gray.

APPENDIX.

Chief domesticated mammals in Japan are as follows.

1. Rabbit, Usagi (*Lepus cuniculus*).
 2. Albino-rat, Daikoku-nezumi.
 3. Japanese dancing mouse, Koma-nezumi (*Mus wagneri* var. *rotans*. See Fortuyn: Zool. Anz. xxxix, No. 5/6, 1912).
 4. Guinea-pig (*Cavia cobaya*).
 5. Cat, Neko (*Felis domestica*).
 6. Japanese dog, Nippon-inu (*Canis familiaris japonicus*).
 7. Swine, Buta (*Sus scrofa domestica*).
 8. South-China cattle (*Bos chinensis*).—Formosa.
 9. Cattle, Ushi (*Bos taurus*).
 10. Buffalo (*Bubalus bubalis*).—Formosa.
 11. Sheep, Hitsuji (*Ovis aries*).
 12. Goat, Yagi (*Capra hircus*).
 13. Horse, Uma (*Equus caballus orientalis*).
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**A Catalogue of Hermit-crabs found in Japan
(Paguridea excluding Lithodidae), with
Descriptions of Four New Species.**

By

Arata Terao, *Rigakushi*.

(Zool. Inst., Sci. Coll., Tokyo Imp. Univ.)

With 4 textfigures.

In the present catalogue are listed 68 species of hermit-crabs so far known from Japan. They are referable to 15 genera. Of the above number of species, four seem to me to be new to science and are here described for the first time, viz., *Parapagurus ijimai*, *Pagurus watasei*, *Eupagurus gotoi*, and *Diogenes nitidimanus*. Of the genera given in this paper, *Parapagurus* is taken in the broad sense of including *Sympagurus* Smith under it.

In my studies of the group I have had at disposal the entire collection in the Zoological Institute of the Science College, Tokyo Imp. Univ. For the facilities and useful advices given me in that Institute, it is my pleasant duty herewith to return my cordial thanks to Professors Ijima, Watasé and Gotô. My thanks are also due to several other gentlemen who have assisted me in obtaining materials from different parts of the country. I am under special obligation to Professor S. Ikeda of the High School of Kagoshima, by whose intermediation I have been able to examine not only the collection of that school but also the specimens belonging to some other public institutions of that city.

Family **Paguridae** Dana.

Paguridae, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 435; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 232; Henderson, Challenger Anomura, 1888, p. 52; Stebbing, Hist. Crust., 1893, p. 159; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1145; (pars), Milne-Edwards et Bouvier, Crust. Decap. Hirondelle et Princesse Alice, Monaco, 1899, p. 51; Alcock, Cat. Ind. Deep Sea Crust., 1901, p. 215; and Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 21.

Paguroide (pars), Boas, (Vidensk. Selsk. Skr., 6 Raekke, naturvid. og math., Afd. I. 2, 1880, p. 189).

Parapaguride, Smith, Bull. Mus. Comp. Zool., Harvard, x., 1883, p. 20; Henderson, Challenger Anomura, 1888, p. 85; Stebbing, Hist. Crust., 1893, p. 166.

Genus *Aniculus* Dana.

Aniculus, Dana, U. S. Expl. Exp., Crust., pt. 1., 1852, p. 460; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 234; and Smiths. Misc. Coll., XLIX., 1907, p. 207; Miers, Cat. Crust. New Zealand, 1876, p. 64; Ortmann, Zool. Jahrb., Syst., vi, 1892, p. 276; Stebbing, Hist. Crust., 1883, p. 60; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 94.

Aniculus aniculus (Fabricius).

Pagurus aniculus, Fabricius, (Ent. Syst., II, 1793, p. 468); Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 230.

Cancer aniculus, Herbst, (Krabben, II, 1794, p. 37).

Pagurus ursus, Olivier, (Encycl. Méthod., VIII, 1811, p. 640).

Aniculus typicus, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 461, pl. xxix, fig. 1; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 247; and Smiths. Misc. Coll., XLIX, 1908, p. 207; Heller, Novara Crust., 1865, p. 87; Miers, Cat. Crust. N. Z., 1876, p. 64; and Ann. Mag. Nat. Hist., ser. 5, v, 1880, p. 375; Ortmann, Zool. Jahrb., Syst.,

VI, 1892, p. 289; Whitelegge, Mem. Austral. Mus., III, 1897, p. 144; Borradaile, P. Z. S., 1898, p. 461.

Aniculus aniculus, Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 97; Henderson, Tr. Linn. Soc., Zool., ser. 2, v, 1893, p. 422; Lanchester, P. Z. S., 1902, II, p. 364; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 94, pl. vii., fig. 6.

Note: Common near Misaki. A female specimen from the Nagasaki Prefecture in the Sci. Coll. Mus.

Genus *Calcinus* Dana.

Calcinus, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 456; Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 234; and Smith. Misc. Coll., XLIX, 1907, p. 207; Henderson, Challenger Anomura, 1888, p. 61; Chevreux et Bouvier, Mém. Soc. Zool. France, 1892, p. 126; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 51.

Calcinus elegans (Milne-Edwards).

Pagurus elegans, Milne-Edwards, (Ann. Sci. Nat., Zool., 2 e ser., VI, 1836, p. 278, pl. xiii, fig. 2); and Hist. Nat. Crust., II, 1837, p. 229; Krauss, Südafr. Crust., 1843, p. 57.

Calcinus elegans, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 458, pl. xxviii, fig. 10 a-c; Stimpson, Proc. Acad. Nat. Sci., Philad., 1858; p. 247; and Smiths. Misc. Coll., XLIX, 1907, p. 208; Heller, Novara Crust., 1865, p. 88; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 294; Whitelegge, Mem. Austral. Mus., III, 1897, p. 143; Borradaile, P. Z. S., 1898, p. 461; Lenz, Zool. Jahrb., Syst., XIV, 1901, p. 444; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 53, pl. v, fig. 2.

Pagurus pictus, Owen, (Zool. H. M. S. Blossom, 1839, Crust., p. 83, pl. xxv, fig. 2).

Pagurus decorus, Randall, (Journ. Acad. Philad., 1839, p. 134).

Note: A male specimen in the collection of the Kagoshima I. Middle School, from Miyano-ura in Yakushima, Prov. Ōsumi.

Calcinus gaimardi (Milne-Edwards).

Pagurus gaimardi, Milne-Edwards, Ann. Sci. Nat., 3 e sér., I, 1848, p. 63.

Calcinus gaimardi, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 457, pl. xxviii, fig. 9; Heller, Novara Crust., 1865, p. 87; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 294; Borradaile, P. Z. S., 1898, p. 462; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 59, pl. v, fig. 3.

Note: I have not been able to examine this species.

Calcinus lævimanus (Randall).

Pagurus lævimanus, Randall; (Journ. Acad. Sci., Philad., VIII, 1839, p. 135).

Pagurus tibicen, Krauss, Südafr. Crust., 1843, p. 57; Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 229.

Calcinus tibicen, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 457; Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 247; and Smiths. Misc. Coll., XLIX, 1907, p. 208; Heller, Novara Crust., 1865, p. 87; Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 97; Miers, Zool. H. M. S. "Alert," 1884, pp. 519, 557; Henderson, Challenger Anomura, 1888, p. 61; Whitelegge, Mem. Austral. Mus., III, 1897, p. 144.

Calcinus herbstii, de Man, Arch. f. Nat., LIII, 1887, I, p. 437; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 292; Borradaile P. Z. S., 1898, p. 462; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 53, pl. v, fig. 4.

Calcinus lævimanus, Rathbun, Smiths. Misc. Coll., XLIX, 1907, p. 208, footnote correction of Stimpson's "*Calcinus tibicen* (Herbst) Dana"; Stebbing, Ann. S. Afr. Mus., VI, pt. iv, 1910, p. 353.

Note: Preserved in the Sci. Coll. Mus. are: a male from Nase, Amami-Ôshima, Prov. Ôsumi; two females and one male from Naha, Okinawa, Loo Choo; and a male from Kôshun, Formosa.

Calcinus latens (Randall).

Pagurus latens, Randall, (Journ. Acad. Nat. Sci., Philad., 1839, p. 135).

Calcinus latens, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 459, pl. xxviii, fig. 11; Stimpson, Proc. Acad. Nat. Sci., Philad., 1858, p. 247; and Smith. Misc. Coll., XLIX, 1907, p. 208; Heller, Novara Crust., 1865, p. 88; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 293; Whitelegge, Mem. Austral. Mus., III, 1897, p. 143; Borradaile, P. Z. S., 1898, p. 463; Lenz, Zool. Jahrb., Syst., XIV, 1901, p. 443; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 58, pl. v, fig. 5; Grant, Proc. Linn. Soc. N. S. Wales, 1906, pt. 1, p. 34.

Calcinus intermedius, de Man, (Notes Leyden Mus., III, 1881, p. 102).

Calcinus terræ-reginæ, Haswell, (Proc. Linn. Soc. N. S. Wales, VI, 1881-82, p. 760); de Man, Arch. f. Nat., LIII, i, 1887, p. 439; Journ. Linn. Soc., Zool., XXII, 1888, p. 226; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 57, pl. v, fig. 7.

Note: The Sci. Coll. Mus. contains a male specimen from Naha, Okinawa, Loo Choo, which seems to show much more resemblance to *C. terræ-reginæ* than to typical *C. latens*.

Genus *Catapagurus* Milne-Edwards.

Catapagurus, Milne-Edwards, Bull. Mus. Comp. Zool. Harvard, VIII, 1880, p. 46; Smith, Bull. Mus. Comp. Zool. Harvard, X, 1882, p. 14; Henderson, Challenger Anomura, 1888, p. 75; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool. Harvard, XIV, no. 3, 1893, p. 125; Stebbing, Hist. Crust., 1893, p. 165; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 114.

Hemipagurus, Smith, Ann. Mag. Nat. Hist., ser. 5, VII, 1881, p. 143.

Catapagurus doederleini Doflein.

Catapagurus doederleini, Doflein, Abh. d. k. bayer. Akad. d. Wiss., Cl. II, Bd. XXI, Abh. III, 1902, p. 624, taf. vi, fig. 4 et 5.

Note: No specimen has come under my examination.

Genus *Clibanarius* Dana.

Clibanarius Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 461; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 234; and Smiths. Misc. Coll., XLIX, 1907, p. 208; Miers, Crust. N. Zealand, 1876, p. 67; Henderson, Challenger Anomura, 1888, p. 60; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool., Harvard, XIV, 3, 1893, p. 156; Stebbing, Hist. Crust., 1893, p. 160; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 40.

Clibanarius bimaculatus (de Haan).

Pagurus bimaculatus, de Haan, Faun. Japon., Crust., 1849, p. 210, tab. 49, fig. 7, tab. 50, fig. 4.

Clibanarus bimaculatus, Ortmann, Zool. Jahrb., Syst., VI, 1892 pp. 290, 291.

Note: A male from Kataura, Prov. Satsuma, in the Sci. Coll. Mus. A striking difference between de Haan's original description and that specimen lies in the relative size of the chelipeds. From an examination of males, de Haan put down "pede antico sinistro in maribus majore," whereas in the single male specimen on hand the *right* cheliped is slightly more massive than the *left*. Longitudinal groove not present on dactyli of ambulatory legs, a negative character utilized by Ortmann for one of the points by which this species may be distinguished from *Cl. misanthropus*. Of the two figures given by de Haan, the one (tab. 50, fig. 4) well represents the species; the other (tab. 49, fig. 7) is not at all referred to in the descriptive text and differs much from the figure just mentioned but greatly resembles *Eupagurus samuelis* Stimpson in general appearance.

Clibanarius corallinus (Milne-Edwards).

Pagurus corallinus, Milne-Edwards, (Ann. Sci. Nat., Zool., 3e sér., x, 1848, p. 63).

Pagurus globosimanus, Dana, (Proc. Acad. Nat. Sci. Philad., 1851, p. 271).

Clibanarius globosimanus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 247.

Clibanarius obesomannus (?*corallinus*), Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 468, pl. xxix, fig. 8a-e.

Clibanarius corallinus, Heller, Novara Crust., 1865, p. 89; de Man, Arch. f. Nat., LIII, 1887, I, p. 447; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 292; Borradaile, P. Z. S., 1898, p. 463; Lanchester, P. Z. S., 1902, II, p. 365; Alcock, Cat., Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 48, pl. v, fig. 1.

Clibanarius globosomannus, Stimpson, Smiths. Misc. Coll., XLIX, 1907, p. 210.

Note: A male specimen from Nakanoshima, Kagoshima Prefecture, in the collection of the 7th High School (Kagoshima city).

***Clibanarius japonicus* Rathbun.**

Clibanarius japonicus, Rathbun, Proc. U. S. Nat. Mus., 1903, p. 35, fig. 2-5.

Note: This species and the following three have not come under my examination.

***Clibanarius longitarsis* (de Haan).**

Pagurus longitarsis, de Haan, Faun. Jap., Crust., 1849, p. 211, pl. i, fig. 3.

Clibanarius longitarsis, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 464; Stimpson, Proc. Acad. Nat. Sci. Philad. 1858, p. 247; and Smiths. Misc. Coll., XLIX, 1907, p. 209; Heller, Novara Crust., 1865, p. 90; Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 96; Ortmann, in Semon's Zool. Forschungsr., Crust., 1894, p. 31; Lanchester, P. Z. S., 1902, II, p. 365.

***Clibanarius pacificus* Stimpson.**

Clibanarius pacificus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 211.

Clibanarius striolatus Dana.

Clibanarius striolatus, Dana, U. S. Expl. Exp., Crust., pt. 1, p. 463, pl. xxix, fig. 3 a-c; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, pl. 247; Heller, Novara Crust., 1865, p. 89; de Man, Arch. f. Nat., LIII, i, 1887, p. 445; Ortmann, Zool. Jahrb, Syst., VI, 1892, p. 290; Lanchester, P. Z. S., 1902, p. 365; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 46, pl. iv, fig. 7.

Genus *Diogenes* Dana.

Diogenes, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 438; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 232; and Smiths. Misc. Coll., XLIX, 1907, p. 201; Henderson, Challenger Anomura, 1888, p. 53; Stebbing, Hist. Crust., 1893, p. 160; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 59.

Diogenes edwardsii (de Haan).

Pagurus edwardsii, de Haan, Faun. Japon., Crust., 1849, p. 211 tab. 50, fig. 1.

Diogenes edwardsii, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 202, pl. xxiv, fig. 1; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 295.

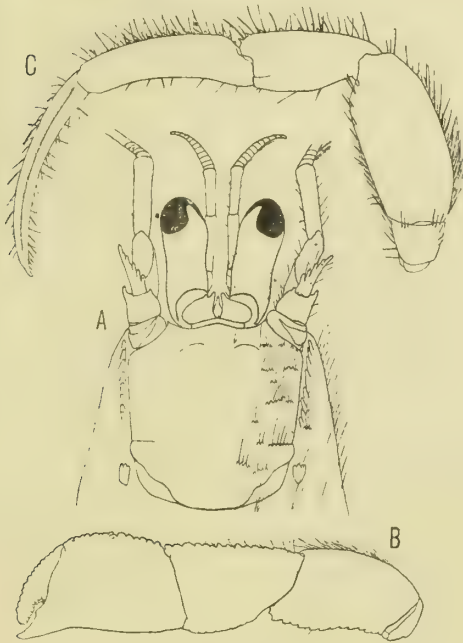
Note: A male specimen in Mr. M. Nakamura's collection made in the Niigata Prefecture. In the Sci. Coll. Mus there are: a male from the Nagasaki Prefecture; two males and two females from Tomo-no-tsu, Prov. Bingo; a male from the Yamaguchi Prefecture; a male from Prov. Kii; several specimens from Kominato, Prov. Awa; and two males from an unknown locality.

The smaller individuals agree in the shape and granulation of left cheliped and in the relative length of eyestalks with *D. spinifrons* (de Haan), a form which was regarded by Ortmann to be the young of this species; while in other important characters, f. i., in the spinulose antennal acicles and in the setose dactyli of crawling legs, they tally completely with the description given by de Haan of *Pagurus edwardsii*.

Diogenes nitidimanus, n. sp.

(Textfig. 1).

Carapace depressed, broadened posteriorly, well-calcified in front of cervical groove, with several transversely or obliquely directed,



Textfig. 1.

Diogenes nitidimanus, n. sp. A, anterior half of carapace, $\times 8$; B, left cheliped. $\times 6$; C, 3rd left leg, $\times 7$.

antennular and antennal peduncles. Eyes occupy about the third distal part of the terminal joint of eyestalks. Ophthalmic scales juxtaposed, large and broad, tipped with one or two spinules. The spine on ophthalmic somite acute, entire, short.

Antennal peduncles slightly setose, longer than antennular peduncle; antennal acicles spinulose and slightly setose, shorter than the penultimate joint of antennal peduncle; antennal flagella about as

close series of setose granules in antero-lateral regions; on each side a longitudinal row of teeth, running for nearly two-thirds the length of carapace in front of cervical groove. A short way posteriorly from the hind end of the teeth row, there is a small well-calcified areolet which is anteriorly spinulose. Rostrum broad, almost rounded off and indistinct, less prominent than antero-lateral teeth of the anterior border of carapace.

Eyestalks very stout, slightly narrowed in the middle, shorter than the anterior border of carapace,

long as the carapace measured in the median line, provided with stout long bristles on the ventral side; each bristle bearing on the ventral side a series of paired setae growing out vertically.

Left cheliped twice as long as the carapace measured in the median line; the whole cheliped almost hairless except on the dorsal setose surface of merus, and somewhat glossy on surface in spite of the granulation; upper border of hand and carpus well-defined; all joints elongate; hand about twice as long as broad, index acute.

Right cheliped wanting.

Second and third pairs of legs setose, spinulose on the upper border of propodus and carpus; dactylus longer than propodus, with a longitudinal groove on the outer surface.

Note: A male specimen from Prov. Sagami is in Mr. R. Saitô's collection. The species is closely allied to *D. granulatus* Miers, from which it differs however in the ophthalmic scales being apically spinulose instead of being entire. The present species is also near to *D. brevirostris* Stimpson, but this differs from it in the carpus of left cheliped being short and of a triangular shape.

Diogenes penicillatus Stimpson.

Diogenes penicillatus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 245; and Smiths. Misc. Coll., XLIX, 1907, p. 200.

Note: No specimen has come under my examination.

Diogenes spinifrons (de Haan).

Pagurus spinifrons, de Haan, Faun. Japon., 1849, p. 212, pl. xlix, fig. 6.

Diogenes edwardsii, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 295.

Note: I have not been able to examine specimens which are referable to this species.

Genus *Eupagurus* Brandt.

Eupagurus, Brandt, in Middlendorf's Reise in Sibiriens, Zool., II, i, 1851, p. 105; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 236; and Smiths. Misc. Coll., XLIX, 1907, p. 215; Miers, Cat. Crust.

N. Zealand, 1876, p. 62; Henderson, Challenger Anomura, 1888, p. 62; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 297; and in Bronn's Thierreich, Malacostraca, p. 1145; Benedict, Proc. U. S. Nat. Mus., XV, 1892, p. 1; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool., Harvard, XIV, 3, 1893, p. 139; and Crust. Dec. "Hirondelle," Monaco, 1894, p. 73; Stebbing, Hist. Crust., 1893, p. 160; and P. Z. S., 1900, p. 534; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 122.

Bernhardus, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 440.

Note: Under this genus I place a new species which will be designated *E. gotoi*, although the type specimen (a male) is entirely without a fourth abdominal appendage. It follows that occasional absence of that appendage should be admitted within the range of the genus.

***Eupagurus angustus* Stimpson.**

Eupagurus angustus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 250; and Smiths. Misc. Coll., XLIX, 1907, p. 225.

Note: No specimen has come under my examination.

***Eupagurus barbatus* Ortmann.**

Eupagurus barbatus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 311.

Note: I have not been able to examine this species.

***Eupagurus brachiomastus* Thallwitz.**

Eupagurus brachiomastus, Thallwitz, (Abh. u. Ber. Zool. Mus. Dresden, 1891, No. 3, p. 35); Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 312.

Note: No specimen has come under my examination.

***Eupagurus cavimanus* Miers.**

Eupagurus cavimanns, Miers, P. Z. S., 1878, pp. 21, 48, pl. iii, fig. 1.

Note: This species is very closely allied to *E. gotoi*, but differs from it in having the merus of right cheliped concave instead of being convex on the dorsal surface, and in the more prominent rostrum. I have had no specimen which is referable to this species.

Eupagurus conformis (de Haan).

Pagurus conformis, de Haan, Faun. Jap., Crust., 1849, p. 206.

Eupagurus conformis, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 305; Doflein, Abh. d. k. bayer. Akad. d. Wiss., Cl. II, Bd. XXI, Abth. iii, 1902, p. 647.

Note: No specimen has come under my examination.

Eupagurus constans Stimpson.

Eupagurus constans, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 248; and Smiths. Misc. Coll., XLIX, 1907, p. 218, pl. xxiv, fig. 3; Henderson, Challenger Anomura, 1888, p. 67, pl. vi, fig. 8; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 310; Doflein, Abh. bayer. Akad. Wiss., XXI, iii, 1902, p. 647.

Note: Numerous specimens from Misaki and two females from the Nagasaki Prefecture in the Sci. Coll. Mus. They inhabit gastropod-shell-like colonies of *Hydractinia sodalis* Stimpson and of *H. spiralis* Goto.

In all the specimens before me, antennal acicles do not quite reach up to the level of the extremity of eyestalks, while the legs of the right side extend well beyond the tip of the larger cheliped. In these respects, the specimens may be said to stand not in exact harmony with Stimpson's description and figure of the species.

Eupagurus gotoi, n. sp.

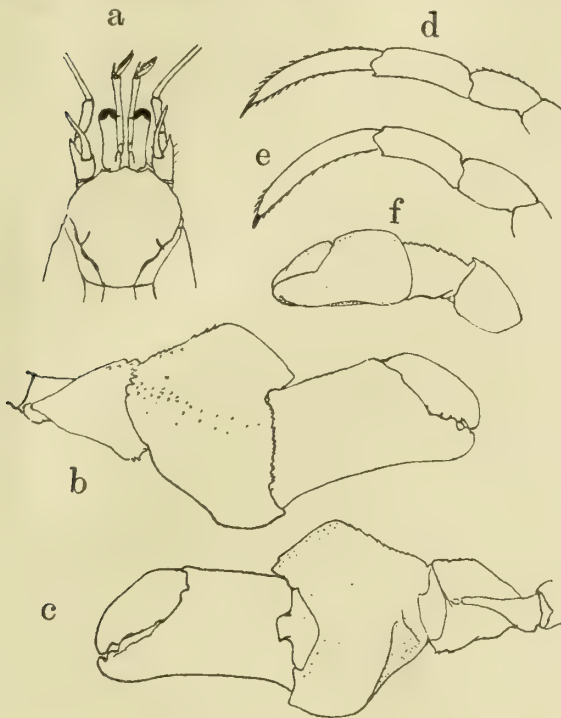
(Textfig. 2).

Almost hairless throughout entire body. Carapace depressed, broadened posteriorly, strongly calcified in the pear-shaped area in front of cervical groove, but very thin and almost transparent in the branchial region so that most of the gills can be seen through from the dorsal side of carapace.

Rostrum broadly triangular, pointed at tip, slightly carinated, projecting a very short way beyond the level of the antennal angles of carapace; the antennal angle tipped with a minute spinule.

Eyestalks moderately large, overlapping the last joint of antennular peduncles just at base, slightly curved outward; eyes scarcely

dilated, taking up about a fourth part of the terminal joint of eye-stalk; ophthalmic scales small, lanceolate, deeply concave, distant.



Textfig. 2.

Eupagurus gotoi, n. sp. Nat. size. *a*, Anterior half of carapace; *b*, outer view, *c*, inner view, of right cheliped; *d*, 2nd left leg; *e*, 3rd left leg; *f*, outer view of right cheliped.

Antennal acicle curved, slightly setose, nearly as long as the last joint of antennal peduncle and reaching beyond the level of the distal end of eye-stalk; antennal flagellum about two and a half times as long as carapace, almost nude or with but sparsely set minute setae.

Right cheliped much larger than the left, about $2\frac{3}{5}$ times the length of carapace; the merus triangular, spinulose in the distal part of the upper border, spinose along

the upper part of distal margin, the inner surface hollowed out for accommodation of the lobe of the carpus in flexion, the lower ridge spinulose; carpus very much broadened, raised into thin leaf-like ridge along both borders, spinose along the proximal half of the upper border as well as along the median line on the outer surface, finely spinulose on the outer anterior margin, deeply concave on the inner surface, the concave area kidney-shaped, the lower proximal ridge most prominent; hand about twice as long as broad, inconspicuously granulous on the upper border of palm.

Left cheliped reaches to base of right palm ; the merus spinulose along the upper border ; the carpus spinulose along both inner and upper borders ; the hand deeply concave, spade-shaped, with a thin marginal ridge, which in the basal part of the propodus covers over the articulation of the latter with the carpus and distally towards the finger-tips becomes gradually obliterated, the ridge on the movable finger running nearly in the median line of its surface.

Ambulatory legs of both sides compressed, their tip reaching beyond that of the left but not that of the right cheliped ; distinctly spinulose along the upper border of the carpus of the 2nd and 3rd right legs as well as of the 2nd left leg ; dactylus longer than propodus, with an inconspicuous longitudinal groove on both outer and inner surfaces, beset with strong bristles along its upper and lower borders.

Abdominal appendages, excepting those that form the tail-fan, are only two in number, viz., the 3rd and the 5th, both of which are unequally biramous and are situated on the left side.

Terga very thin and but little calcified, excepting those of the somites which form the tail-fan. The 4th and 5th terga have each a pair of round convex areas separated from each other by a considerable space.

Colour in spirit : biscuit yellow or brownish yellow, with spots of a paler colour on ambulatory legs, especially on their outer surface.

Note A male specimen (Mus. No. Cr. 335), preserved in the Imperial Museum at Ueno, Tokyo ; it is from the Aomori Prefecture. The shape of both chelipeds is suggestive of a digging or burrowing habit. The specimen, at the time of my examining it, was smeared with mud, especially on the dorsal concave surface of the left hand. This species can be easily distinguished from the others by its characteristic chelipeds. As already stated, the species is very closely allied to *E. cavimanus*.

Eupagurus gracilipes Stimpson.

Eupagurus gracilipes, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 248 ; and Smiths. Misc. Coll., XLIX, 1907, p. 217 ; Doflein,

Abh. d. k. Akad. d. Wiss., Cl. II, Bd. XXI, Abth. III, 1902, p. 647, pl. vi, fig. 6-8.

Eupagurus lævimanus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 302, pl. xii, fig. 13.

Note: Numerous males and females from Misaki; several from Takashima, Prov. Shiribeshi, and also from Okushiri-jima, Hokkaidô.

***Eupagurus hirsutiusculus* (Dana).**

Bernhardus hirsutiusculus, Dana, U. S. Expl. Exp., Crust., pt. I, 1852, p. 443, pl. xxvii, fig. 3.

Eupagurus hirsutiusculus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 250; also in Smiths. Misc. Coll., XLIX, 1907, p. 223.

Note: No specimen has come under my examination.

***Eupagurus hirtimanus* (White).**

Pagurus hirtimanus, White, (List Crust. Brit. Mus., 1847, p. 60).

Eupagurus japonicus?, Miers, Ann. Mag. Nat. Hist., ser. 5, V, 1880, p. 375, pl. xiv, fig. 6, 7.

Eupagurus hirtimanus, de Man, Arch. f. Nat., 1887, I, p. 426; Ortmann, in Semon's Zool. Forschungsr. Crust., 1894, p. 32.

Note: I have examined a specimen from Prov. Kii; a male in Mr. M. Nakamura's collection made in the Niigata Prefecture; numerous specimens from Takashima, Prov. Shiribeshi in Hokkaido, inhabiting either gastropod shell or sponge; and a male from the Nagasaki Prefecture.

The specimens which protect their abdomen in sponge are remarkable for having the spinules on the dorsal surfaces of chelae more strongly developed than in those which inhabit gastropod shell.

***Eupagurus japonicus* Stimpson.**

Eupagurus japonicus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 250; and Smiths. Misc. Coll., XLIX, 1907, p. 226, pl. xxv, fig. 2; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 309, pl. xii, fig. 16.

Eupagurus similis, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 310; Doflein, Abh. d. k. Akad. d. Wiss., Cl. II, Bd. III, Abth. III, 1902, p. 646.

Eupagurus barbatus, Ortmann, Zool. Jahrb., Syst., VII, 1892, p. 311.

Note: Abundantly found near Misaki; also many specimens from Kominato, Prov. Awa.

***Eupagurus lanuginosus* (de Haan).**

Pagurus lanuginosus, de Haan, Faun. Japon. Crust., 1849, p. 207; Doflein, Abh. d. k. Akad. d. Wiss., Cl. II, Bd. XXI, Abth. III, 1902, p. 646.

Note: I have not been able to examine this species.

***Eupagurus lepidochirus* Doflein.**

Eupagurus lepidochirus, Doflein, Abh. d. k. Akad. d. Wiss., Cl. II, Bd. XXI, Abth. III, 1902, p. 623.

Note: No specimen has come under my examination.

***Eupagurus megalops* Stimpson.**

Eupagurus megalops, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 248; also in Smiths. Misc. Coll., XLIX, p. 216, pl. xxiv, fig. 2.

E. carpofoaminatus var. *nephromma*, Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 131, pl. xi, fig. 4, 4a.

Note: To the above species which was described by Stimpson from the North China Sea I refer two male specimens contained in the Sci. Coll. Museum. They were obtained by a trawler in the Nagasaki Prefecture. Both exhibit a pin-hole-like depression on the ventral side of the carpus of each cheliped, and seem to be also referable to Alcock's *E. carpofoaminatus* var. *nephromma*, but not exactly with typical *E. carpofoaminatus* of the same author. In fact I am greatly inclined to think that the depression has escaped Stimpson's attention and that *E. carpofoaminatus* var. *nephromma* Alcock is identical with his *E. megalops*. If I am right in this assumption, it follows that Alcock's typical *E. carpofoaminatus* should be called *E. megalops* var. *carpofoaminata*, which may be distinguishable from typical *E. megalops* by having, amongst other points of difference, relatively longer dactyli to second and third pairs of legs, the dactyli being about twice (instead of about one and a half times) longer than the propodite.

The specimens in question, which were at first put into formalin but were afterwards transferred into 70% alcohol, show a faint purplish red colouration on the anterior border of carapace and on the dorsal surface of chelipeds and legs. On the legs this colour tends to occur in the form of cross-bands. On the ventral surface the chelipeds

and legs are of a nearly uniform ivory white colour. The granules and spinules on chelipeds and legs as also the entire chelae are nearly white.

***Eupagurus middendorffi* (Brandt).**

Pagurus (Eupagurus) middendorffi, Brandt, Middendorff's Sibir. Reise, Krebse, 1849, p. 32, (tab. 5, fig. 2-16).

Eupagurus middendorffi, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 301; Doflein, Fauna Arctica, 1900, p. 646, Abh. bayer. Akad. Wiss., Cl. II, Bd. XXI, Abth. III, 1900, p. 646.

Note: No specimen has come under my examination.

***Eupagurus obtusifrons* Ortmann.**

Eupagurus obtusifrons, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 313.

Note: This species and the following three have not come under my examination.

***Eupagurus ophthalmicus* Ortmann.**

Eupagurus ophthalmicus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 314.

***Eupagurus pectinatus* Stimpson.**

Eupagurus pectinatus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 249; and Smiths. Misc. Coll., XLIX, 1907, p. 220.

***Eupagurus pilosipes* Stimpson.**

Eupagurus pilosipes, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 249; and Smiths. Misc. Coll., XLIX, 1907, p. 223.

***Eupagurus samuelis* Stimpson.**

Eupagurus samuelis, Stimpson, (Journ. Boston Soc., 1857, p. 482); Proc. Acad. Nat. Sci. Philad., 1858, p. 250; and Smiths. Misc. Coll., XLIX, 1907, p. 224; Ortmann, Zool. Jahrb. Syst., VI, 1892, p. 301; Holmes, Occas. Papers Cal. Acad. Sci., 1900, p. 144; Doflein, Abh. bayer. Akad. Wiss., Cl. II, Bd. XXI, Abth. III, 1902, p. 646.

Eupagurus dubius, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 307, pl. xii, fig. 14; Doflein, Abh. bayer. Akad. Wiss., Cl. II, Bd. XXI, Abth. III, 1902, p. 646.

Note: Very common near Misaki. In the Sci. Coll. Mus. there are several specimens from Kominato, Prov. Awa; further, two males from Idzughara, Prov. Tsushima; numerous specimens from Hosojima, Prov. Hizen; and some number of specimens from Chichi-jima, Bonin Is.

***Eupagurus seriespinosus* Thallwitz.**

Eupagurus seriespinosus, Thallwitz, (Abh. u. Ber. Zool. Mus. Dresden, 1891, no. 3, p. 34); Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 177.

Note: No specimen has come under my examination.

***Eupagurus spinimanus* (Brandt).**

Pagurus (*Eupagurus*) *bernhardus* var. *C. spinimana*, Brandt, Sibirische Reise, Zool., 1851, p. 108.

Pagurus (*Eupagurus*) *ochotensis*, Brandt, loc. cit.

Bernhardus armatus, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 442, pl. xxviii, fig. 2, a-c.

Eupagurus armatus, Stimpson, (Bost. Journ. Nat. Hist., VI, 1857, p. 484).

Eupagurus ochotensis, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 248; and Smiths. Misc. Coll., XLIX, 1907, p. 218; Holmes, Occas. Papers Cal. Acad. Sci., VIII, 1900, p. 137; Benedict, Proc. U. S. Nat. Mus., 1901, p. 463.

Note: In the Sci. Coll. Mus. there are: two males from Oshika, Prov. Rikuzen; a male from off Chipesani in Saghalin; and several from Takashima, Prov. Shiribeshi in Hokkaido.

***Eupagurus tricarinatus* Stimpson.**

Eupagurus tricarinatus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 251; and Smiths. Misc. Coll., XLIX, 1907, p. 228.

Note: I have not been able to examine this species.

***Eupagurus trigonoeirus* Stimpson.**

Eupagurus trigonoeirus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 221, pl. xxvi, fig. 2.

Note: A male from Oshika, Prov. Rikuzen, and several specimens inhabiting the gastropod-shell-like colonies of a *Hydractinia* in the Sci. Coll. Mus. I have also found a female in Mr. M. Nakamura's collection made in the Niigata Prefecture.

***Eupagurus triserratus* Ortmann.**

Eupagurus triserratus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 308, pl. xii, fig. 15.

Note: No specimen has come under my examination.

Genus *Paguristes* Dana.

Paguristes, Dana, (Proc. Acad. Nat. Sci. Philad., 1851, p. 269); and U. S. Expl. Exp., Crust., pt. I, 1852, p. 436; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 236; and Smiths. Misc. Coll., XLIX, 1907, p. 211; Henderson, Challenger Anomura, 1888, p. 77; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool. Harvard, XIV, 3, 1893, p. 32; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146; Benedict, Bull. U. S. Fish Comm., XX, 2, 1900, p. 143; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. I, 1905, p. 30.

***Paguristes acanthomerus* Ortmann.**

Paguristes acanthomerus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 279, Taf. 12, Fig. 6.

Note: The species occurs in abundance near Misaki. In all the specimens examined the right cheliped was invariably slightly more massive than the left.

***Paguristes barbatus* (Heller).**

Clibanarius barbatus, Heller, (Verh. zool. bot. Ges. Wien, 1862, p. 524); and Novara Crust., 1865, p. 90, pl. viii, fig. 5.

Paguristes barbatus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 279, pl. xii, fig. 7; Doflein, Abh. bayer. Akad. Wien, Cl. II, Bd. XXI, Abth. III, 1902, p. 645.

Note: No specimen has come under my examination

***Paguristes digitalis* Stimpson.**

Paguristes digitalis, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 247; and Smiths. Misc. Coll., XLIX, 1907, p. 212, pl. xxx, fig. 1.

Paguristes kagoshimensis, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 281, pl. xii, fig. 8.

Note: Common in the neighbourhood of Misaki. According to Ortmann, this species should be very nearly allied to, if not identical with, *Paguristes barbatus* (Heller). As a point of marked difference between the two, it should be mentioned that, whereas *P. barbatus* possesses ten gills in all, *P. digitalis* has thirteen of them. Moreover, in the specimens which I refer to this species the dactylus of crawling legs is distinctly longer than the propodus, instead of the two joints being equally long as given for *P. barbatus*; and the abdominal appendages are slightly curved outwards in the distal parts as in *P. acanthomerus*, not straight as they should be in *P. barbatus*.

***Paguristes palythophilus* Ortmann.**

Paguristes palythophilus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 277, pl. xii, fig. 5.

Note: There is in the Sci. Coll. Mus. a single male specimen from Misaki which I should refer to this species, though differing somewhat from Ortmann's description in two points, viz. (1) in the rostrum being relatively shorter and not reaching to the extremity of ophthalmic scales, and (2) in the dactyli being only slightly—instead of considerably—longer than propodi of ambulatory legs.

***Paguristes seminudus* Stimpson.**

Paguristes seminudus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 247; and Smiths. Misc. Coll. XLIX, 1907, p. 213.

Note: A male and two females from the Nagasaki Prefecture in Mr. R. Saitô's collection. In the former the eye-stalks are slender; in the latter which are of a smaller size, they are stouter. The spinules in the antero-lateral regions of carapace are scarcely recognizable in the females.

Genus *Pagurus* Fabricius, sensu stricto.

Pagurus (pars), Fabricius, (Ent. Syst. Suppl., 1798, p. 411); Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 213; de Haan, Faun. Japon., Crust., 1849, p. 202.

Pagurus, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 449; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 233; and Smiths. Misc. Coll., XLIX, 1907, p. 204; Miers, Cat. Crust. N. Zealand, 1876, p. 65; Henderson, Challenger Anomura, 1888, p. 55; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool. Harvard, XIV, 3, 1893, p. 161; Stebbing, Hist. Crust., 1893, p. 160; Alcock, Cal. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 78.

Dardanus, Paulson, (Red Sea Crust., 1875, p. 90); Rathbun, Proc. U. S. Nat. Mus., 1903, p. 33.

Pagurias, Benedict, Bull. U. S. Fish Comm., 1901, p. 141.

Pagurus arrosor (Herbst).

Cancer arrosor, Herbst, (Krabben, II, 1794, p. 170, pl. xliii, fig. 1).

Pagurus strigosus, Bosc, (Hist. Nat. Crust., II, 1803, p. 77, pl. xi, fig. 3).

Pagurus striatus, Latreille, (Hist. Nat. Crust. et Ins, v, 1803, p. 163); Milne-Edwards, Hist. Nat. Crust., II, p. 218; de Haan, Faun. Japon., Crust., 1849, p. 206, pl. xlix, fig. 1; Miers, Ann. Mag. Nat. Hist., ser. 5, VIII, 1881, p. 274; Studer, Abh. Ak. Berlin, 1883, p. 23; Henderson, Challenger Anomura, 1888, p. 56; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 283; Chevreux et Bouvier, Mém. Soc. Zool. France, 1892, p. 119; Whitelegge, Mem. Austral. Mus., VI, pt. 2, 1900, p. 166.

Pagurus incisus, Olivier, (Encycl. Méth., VIII, 1811, p. 641).

Pagurus arrosor, Milne-Edwards et Bouvier, Crust. Dec. Travailleur et Talismann, pt. 1, 1900, p. 178; Moreira, Arch. Mus. Nac.,

Rio de Jan., XI, 1901, pp. 24, 85; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 168; Nobili, Ann. Sci. Nat., 9e sér., Zool., 1906, p. 121; Stebbing, Ann. S. Af. Mus., VI, pt. 1, 1908, p. 22; and VI, pt. 4, 1910, p. 350.

Note: A male form the Niigata Prefecture, in the collection of Mr. M. Nakamura; a female from Shidzuoka, Prov. Suruga, and numerous males and females from Misaki, in the Sci. Coll. Mus.

As the hermit-crab grows larger, the antennal peduncle comes to reach beyond eyestalk. Medium-sized specimens frequently still show the peduncle shorter than eyestalk. Near Misaki this species is always found in company with *Adamsia rondeletii* (Chiaje) attached to the shell inhabited by it.

Pagurus asper de Haan.

Pagurus asper, de Haan, Faun. Japon., Crust., 1849, p. 208, pl. 1, xlix, fig. 4; Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 450; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; Ortmann, in Semon's Zool. Forschungsr., 1894, p. 31; Borradaile, Stomatop. and Mac. Willey's Exped., 1899, pp. 396, 397, 424; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 90, pl. ix, fig. 5.

Pagurus pedunculatus, Miers, Ann. Mag. Nat. Hist., ser. 5, v, 1880, p. 374.

?*Pagurus sigmoidalis*, Zehnter, (Rev. Suisse Zool. Ann. Mus. Genève, II, 1894, p. 192, pl. viii, fig. 19 a-b).

Dardanus haani, Rathbun, Proc. U. S. Nat. Mus., XXVI, 1903 p. 34.

Note: No specimen has come under my examination.

Pagurus deformis Milne-Edwards.

Pagurus deformis, Milne-Edwards, (Ann. Sci. Nat., Zool., sér. 2, VI, 1836, p. 272, pl. xiv, fig. 2); and Hist. Nat. Crust., II, 1837, p. 222; Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 449; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Mic. Coll., XLIX, 1907, p. 204; Heller, Novara Crust., 1865, p. 86; de Man, Arch. f. Nat., LIII, i, 1887, p. 435; and Journ. Linn. Soc. Zool., XXII, 1888,

p. 225; Henderson, Challenger Anomura, 1888, p. 57; and Trans. Linn. Soc. Zool., v, pt. 10, 1893, p. 420; Ortmann, Zool. Jahrb. Syst., VI, 1892, p. 288, and in Semon's Zool. Forschungsr. Austral., 1894, p. 31; Borradaile, P. Z. S., 1898, p. 460; and Stom. and Macrura Willey's Exp., 1899, p. 424; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 88, pl. ix, fig. 4; Nobili, Ann. Sci. Nat., 9 e sér., Zool., VI, 1906, p. 122.

Pagurus cavipes, White, (P. Z. S., 1847, p. 122).

Pagurus cultratus, White, (List Crust. Brit. Mus., 1848, p. 60).

Dardanus pedunculatus, Rathbun, Smiths. Misc. Coll., XLIX, 1907, p. 204.

Note: A specimen from Chichishima, Bonin Island, and two specimens from Okinawa, Loo choos, in the Sci. Coll. Mus.

The specimen from Chichishima has the first three abdominal appendages weakly triramous. One of the specimens from Okinawa possesses uniramous abdominal appendages; the other is damaged in the abdominal parts. All the three specimens on hand show two pairs of sexual openings.

Pagurus diogenes Fabricius.

Pagurus diogenes, Fabricius, (Ent. Syst. Suppl., 1798, p. 412); de Haan, Faun. Japon., Crust., 1849, p. 208; Ortmann, Zool. Jahrb., Syst., VI, 1892, pp. 282, 285.

Pagurus aspersus, Berthold. (Rep. aus Neu-Grenada u. Crust. aus China, 1856, p. 21, pl. ii, fig. 1).

Note: No specimen has come under my examination.

Pagurus euopsis Dana.

Pagurus euopsis, Dana, (Proc. Acad. Nat. Sci. Philad., 1852, p. 7); and U. S. Expl. Exp., Crust., pt. 1, p. 452, pl. xxviii, fig. 6a-c; de Man, Arch. f. Nat., LIII, 1887, p. 429; Henderson, Challenger Anomura, 1888, p. 58; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 286; and in Semon's Forschungsr. Austral., 1894, p. 30; Borradaile, P. Z. S., 1898, p. 461; and Stom. and Mac. Willey's Exp., 1899, pp. 396,

425; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 86, pl. ix, fig. 2.

Pagurus depressus, Heller, SB. k. Akad. Wien, XLIV, 1861, p. 248; Hilgendorf, MB. k. Akad. Berlin, 1878, p. 814; de Man, Arch. f. Nat., LIII, i, 1887, p. 431.

Note: A female specimen from Nakanoshima, Kagoshima Prefecture, is in the College of Agriculture and Forestry in Kagoshima. Another female specimen from Okinawa in the 7th High School. The two above specimens agree well with each other in shape, and undoubtedly represent typical *P. euopsis*.

Pagurus impressus de Haan.

Pagurus impressus, de Haan, Faun, Japon., Crust., 1849, p. 207, tab. XLIX, fig. 3.

Dardanus impressus, Rathbun, Proc. U. S. Nat. Mus., XXIII, 1902, p. 34.

Note: Five males from Yenoura, Prov. Suruga; and several specimens from the Nagasaki Prefecture in the Sci. Coll. Mus. Tufts of setae sparsely present in scattered distribution on the outer surface of left chela, in spite of de Haan's qualifying it "glaberrimo."

Pagurus megistos (Herbst).

Cancer megistos, Herbst, (Krabben, III, 1804, p. 23, pl. xi, fig. 1).

Pagurus megistos, Olivier, (Encycl. Méth., VIII, 1811, p. 639).

Pagurus punctulatus, Olivier, (Encycl. Méth., VIII, 1811, p. 641); Milne-Edwards, Hist. Crust., II, 1837, p. 222; Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 451, pl. xxviii, fig. 4a-b; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 205; Heller, Novara Crust., 1865, p. 87; Hilgendorf, in v. d. Decken's Reisen in Ost-Afr., III, i, 1869, p. 95; Miers, P. Z. S., 1877, p. 138; Ann. Mag. Nat. Hist., sér. 5, v. 1880, p. 374; and Voy. H. M. S. Alert, 1884, pp. 519, 555; de Man, Arch. f. Nat., LIII, i, 1887, p. 429; and Journ. Linn. Soc., Zool., XXII, 1888, p. 225; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 285; and in Semon's Zool. Forschungsr. Austral., Crust., 1894, p. 30; Henderson, Trans. Linn. Soc. Zool., v, 1893, p. 419; Borradaile, P. Z. S., 1898, p. 461, and Stom. and Mac.

Wiley's Exp., 1899, p. 425; Lanchester, P. Z. S., 1902, p. 364; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 81, pl. viii, fig. 1.

Dardanus punctulatus, Rathbun, Proc. U. S. Nat. Mus., XXVI, 1902, p. 34.

Dardanus megistos, Rathbun, Smiths. Misc. Coll., XLIX, 1907, p. 205.

Pagurus megistos, Stebbing, Ann. S. Afr. Mus., VI, pt. iv, 1910, p. 350.

Note: Three males, one each from Bonin Islands, Yayeyama (Loo-choo Is.) and Iriomotejima (Loo-choo Is.) in the Sci. Coll. Mus.

As in some other species, the right eyestalk is frequently somewhat shorter than the left, the difference being sometimes so slight as to be scarcely noticeable. The larger specimen from the Loo-choos has the inner border of ischium of the left cheliped not crested but provided with a row of tubercles, varying in shape gradationally from the simply rounded of those proximally situated to the somewhat pointed and dome-like of the distalmost tubercle.

Pagurus platythorax Stimpson.

Pagurus platythorax, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 206.

Note: A female from Nago Bay (Okinawa, Loo-choos) and another female from near Kisezaki in the same island are in the collection of the 7th High School in Kagoshima. Three tiramous abdominal appendages present, in which the outer ramus is apically broadened and the middle ramus is the slendermost of all.

Pagurus setifer Milne-Edward.

Pagurus setifer, Milne-Edwards, (Ann. Sci. Nat., Zool., 2e sér., VI, 1836, p. 274); and Hist. Nat. Crust., II, 1837, p. 225; de Haan, Faun. Japon., Crust., 1849, p. 209; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 83, pl. viii, fig. 3. *Vide etiam* de Man, Abh. Senckenb. Nat. Ges., XXV, 1902, p. 739.

Pagurus sculptipes, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 246; and Smiths. Misc. Coll., XLIX, 1907, p. 205.

Pagurus pavimentatus, Hilgendorf, (MB. k. Akad. Berlin, 1878, p. 816, pl. iii, fig. 1-5).

Dardanus sculptipes, Rathbun, Proc. U. S. Nat. Mus., XXVI, 1902, p. 34.

Note: Abundant near Misaki. Larger specimens of the species agree with *P. megistos* in proportions of some parts, f. i., the eyestalk is larger than the antennular peduncle, and the greatest breadth of the propodite of third left leg is equal to about two-fifths of the length of same.

Pagurus vulnerans Thallwitz.

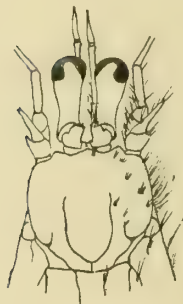
Pagurus vulnerans, Thallwitz, (Abh. u. Ber. K. Zool. Mus. Dresden, 1890-91, no. 3, p. 33); Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 83.

Note: A single male from Wakayama, Prov. Kii, is in the Sci. Coll. Mus. In addition to all the characters pointed out by Alcock, this specimen shows the following points: (1) Eye takes up a third part of the terminal joint of eyestalk; (2) eyestalk distinctly broadened distally; (3) the greatest breadth of carapace across the branchial region is equal to about eight-tenths of the length of same in the median line; and (4) the U-shaped suture line in front of the cervical groove is somewhat divergent anteriorly.

Pagurus watasei, n. sp.

(Textfig. 3).

Carapace little depressed, its greatest breadth across branchial region equal to about seven-eighths the length in the median line; with tufts of bristles in the proximity of anterior and antero-lateral borders. The U-shaped suture-line in front of cervical groove somewhat closing anteriorly, instead of diverging.



Textfig. 3.

Pagurus watasei, n. sp.
Natural size.

Eyestalks depressed, broadened distally, shorter than anterior border of carapace, longer than antennal but shorter than antennular peduncles. The corneal area takes up nearly a third part of the terminal joint of eyestalk. Ophthalmic scales setose and spinulose at apex, widely separated from each other.

Antennal acicles setose and slightly spinulose,

reaching to the end of the proximal third of the last joint of antennal peduncle.

Chelipeds and ambulatory legs thickly beset with thorn-like spines and tufts of bristles, especially in the last three joints and on extensor surfaces; with stronger tooth-like spines along the crest-like inner border of merus and moderately strong spines along the upper inner border of carpus and of the palm of left cheliped.

Left cheliped much larger than the right, its length equal to about seven-eighths that of carapace; lower border of palm with a well-defined series of tubercles.

Ambulatory legs compressed, those of the left side reaching beyond cheliped of the same side; those of the right side even longer.

Abdominal appendages well-developed in the female. Abdominal spur present.

Colour.—In spirit yellowish but reddish towards tip of legs; numerous minute spots of a reddish colour scattered on carapace, legs, and abdominal terga; eyestalks with a broad purplish cross-band; bristles yellowish. Formalin specimens show punctulation of a darker colour; bristles reddish or brownish red and mostly yellowish distally.

Note: The type specimen is a female from Kome-no-tsu, Prov. Satsuma. It is preserved in the Sci. Coll. Mus. Carapace length 32 mm. Further, there are in the same collection two males, one from Prov. Kii and the other from the Nagasaki Prefecture; a female from Tempôzan, Prov. Satsuma, in the collection of the Kagoshima II. Middle School; a male in Mr. R. Saitô's collection; and finally, a male in the collection of the Tokyo Higher Normal School.

This species is closely allied to *Pagurus megistos* (Herbst), but differs from it in the shorter eyestalks, in the punctulation being of a reddish instead of a whitish colour, and in the convergently U-shaped suture-line in front of cervical groove. This species is also very near to *P. diogenes* Fabricius but is distinguishable by the left chela being not so much shortened as in the latter species.

Pagurus wood-masoni Alcock.

Pagurus wood-masoni, Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 85, pl. ix, fig. 3.

Note: A male specimen from Nago Bay, Okinawa (Loo-choos) in the collection of the 7th High School, Kagoshima. Contrary to Alcock's description, the lower border of hand of the larger cheliped is not serrated, but is occupied by black spinules and tubercles which are densest along that border. Bristles are of a brownish carmine colour; crossbands absent.

Genus *Parapagurus* Smith, sensu extenso.

Parapagurus, Smith, Trans. Connect. Acad. v, 1879, p. 50; and Bull. Mus. Comp. Zool. Harvard, x, 1882, p. 20; Henderson, Challenger Anomura, 1888, p. 85; Milne-Edward et Bouvier, Mem. Mus. Comp. Zool. Harvard, XIV, no. 3, 1893, p. 26; and Hironnelle Crust., Brachyures et Anomures, Monaco, 1894, p. 63; Stebbing, Hist. Crust., 1893, p. 166; Holmes, Synop. Calif. Stalk-eyed Crust., 1900, p. 55; Alcock, Cat. Ind. Deep-Sea Crust., 1901, p. 216; and Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 98.

Sympagurus, Smith, Proc. U. S. Nat. Mus., VI, 1883, p. 37; Henderson, Challenger Anomura, 1888, p. 52; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool. Harvard, XIV, no. 3, 1893, p. 58; and Bull. Soc. Zool. France, XXII, 1897, p. 131; and Crust. Déc. Hironnelle et Princesse-Alice, Monaco, 1899, pp. 55, 56; Stebbing, Hist. Crust., 1893, p. 166; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1145; Alcock, Cat. Ind. Deep-Sea Crust., 1901, p. 203; and Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 103.

Note: Smith separated *Sympagurus* from *Parapagurus* merely on the ground that while in the former the arrangement of gill-plates is biserial in the latter it is quadriserial. However, this distinction can not always be carried out with exactness, since in *Sympagurus nudus* Milne-Edwards it is known that some gills have the plates quadriserially arranged, though those forming the outer series on both sides are rudimentary. The new species, which will soon be described under the name of *Parapagurus ijimai*, is another example in which the gill-plates are in a way intermediate between being biserial and quadriserial, in that the biserial gill-plates are each bifid at the distal end. Under these circumstances it seems to me advisable to reunite the two genera.

Parapagurus diogenes (Whitelegge).

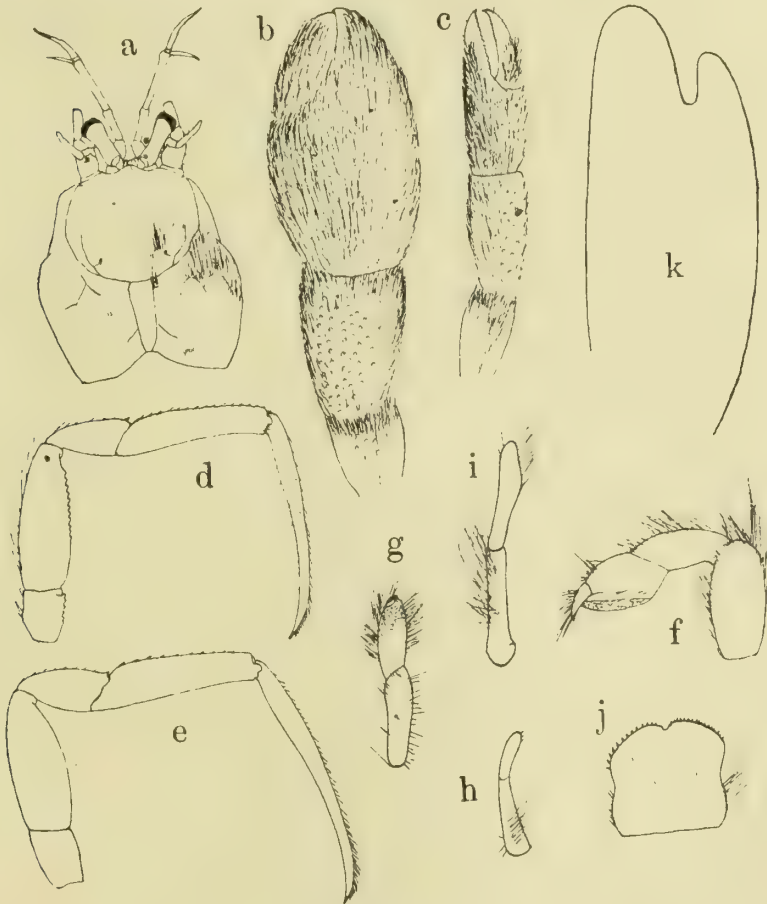
Sympagurus diogenes, Whitelegge, Mem. Aust. Mus., IV, pt. 2, 1900, p. 172, pl. xxxiv, fig. 3.

Note: A single female from Prov. Kii in the Sci. Coll. Mus., showing some insignificant points of disagreement from Whitelegge's description.

Parapagurus iijimai, n. sp.

(Textfig. 4).

Carapace as long as broad, with tufts of long, anteriorly directed setae distributed mainly in the middle transverse zone. The



Textfig. 4.

Parapagurus iijimai, n. sp. a, carapace; b, right cheliped; c, left cheliped; d, 2nd right leg; e, 3rd right leg; f, 4th left leg; g, 5th left leg; h, 1st right abdominal appendage; i, 2nd right abdominal appendage; j, telson; k, gill-plate; a—e, $\times \frac{1}{2}$; f, g, $\times 2$; h—j, $\times 3$; k, $\times 25$.

well-calcified portion in front of the cervical groove is broader than long, its length in the median line being equal to about eight-ninths of the greatest breadth. Rostrum broad but not rounded off, slightly prominent, weakly carinated. Left antero-lateral angle tipped with a small tooth, which is absent on the right.

Eyestalks slightly setose dorsally, broadened distally and slightly inflated at base, half as long as the front border of carapace, reaching far beyond the first joint of antennular peduncle and the penultimate joint of antennal peduncle. Eyes large; ophthalmic scales simple, acute.

Antennular peduncles slightly compressed, as long as the anterior border of carapace, the terminal joint shorter than half their total length; upper flagellum nearly as long as the terminal joint.

Antennal peduncles stout, reaching a short way beyond the end of the second joint of antennular peduncle; acicles long, reaching to the middle of the terminal joint of antennal peduncle, curved, setose, faintly serrulate along the inner edge; flagellum wanting.

Right cheliped much larger than the left, nearly three times as long as carapace, more or less copiously covered all over with long soft hairs, which are densest on merus and upper surface of chela; chela ovato-lanceolate, all other joints elongate; carpus as long as palm and longer than merus; dactylus slightly shorter than palm; upper and lower borders of palm granulous.

The slender left cheliped reaches almost to base of dactylus of the right cheliped; all joints covered with long soft hairs; merus as long as carpus and longer than palm; dactylus longer than palm; with about twenty irregularly disposed granules on the upper border of carpus and a few sparsely set granules on the lower border of palm; under surface of merus and ischium granulous.

Second and third pairs of legs compressed, with a tiny spinule at the distal end of the anterior border of carpus. Merus of the second pair of legs has the lower border well-defined; ischium with a number of granules on the lower border.

Gill-plates biserial, each plate bifid at tip, broad.

Colour in spirit greenish; eyestalks whitish. The peculiar greenish colour of the body is probably due to the verdigris which was produced by the brass-wire used to keep together the broken feet. The alcohol in which the specimen has been preserved also shows a faintly greenish colour.

Note: This new species is based on a male specimen in the S. C. Mus.; it is labelled Okinósé, Sagami Sea; 290 fathoms; May 5th, 1899, Kuma coll. The species is closely allied to *P. pilosimanus*, but differs from this in the much broader shape of the eyestalk. It is also near to *P. bouvieri*, but is distinguishable by the pleopods being apically not so much broadened as in the latter species.

Parapagurus pilosimanus Smith.

Parapagurus pilosimanus, Smith, Trans. Connect. Acad., v, 1879, p. 51; and Proc. U. S. Nat. Mus., vi, 1883, p. 33, pl. v, fig. 3-5, and pl. vi, fig. 1-4a; and Bull. Mus. Comp. Zool. Harvard, x, 1882, p. 20, pl. ii, fig. 4; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool., xvi, no. 3, 1893, p. 28; and Crust. Décap. Travailleur et Talisman, pt. 1, 1900, p. 187, pl. vi, fig. 2, and pl. xxiv, fig. 1-3; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 99, pl. x, fig. 1.

Eupagurus jacobii, Milne-Edwards, Bull. Mus. Comp. Zool., viii, 1880, p. 42.

Parapagurus abyssorum, Henderson, Challenger Anomura, 1888, p. 87, pl. ix, fig. 2; Wood-Mason, Ann. Mag. Nat. Hist., 1891, p. 199; Milne-Edwards et Bouvier, Crust. Decap. Travailler et Talisman, pt. 1, 1900, p. 191, pl. xxiv, fig. 4-6.

Note: No specimen has come under my examination.

Genus *Spiropagurus* Stimpson.

Spiropagurus, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858 p. 236; and Smiths. Misc. Coll., XLIX, 1907, p. 214; Henderson, Challenger Anomura, 1888, p. 71; Milne-Edwards et Bouvier, Mem. Mus. Comp. Zool. Harvard, xiv, No. 3, 1893, p. 110; Stebbing, Hist.

Crust., 1893, p. 165 ; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1145 ; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 117.

Spiropagurus spiriger (de Hann).

Pagurus spiriger, de Haan, Faun. Japon., Crust., 1849, p. 206, pl. xlix, fig. 2.

Spiropagurus spiriger, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 248 ; and Smiths. Misc. Coll., XLIX, 1907, p. 214 ; Henderson, Challenger Anomura, 1888, p. 72 ; and Trans. Linn. Soc., Zool., v, 1893, p. 425 ; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 297 ; Lanchester, P. Z. S., 1902, II, p. 364 ; Rathbun, Proc. U. S. Nat. Mus., XXVI, 1902, p. 37 ; Alcock, Cat. Ind. Dec. Crust., 2, fasc. 1, 1905, p. 118, pl. xiii, fig. 1.

Note : A male from Wakayama, Prov. Kii, and many specimens from the Nagasaki Prefecture in the Sci. Coll. Mus.

Family **Coenobitidae** Dana.

Coenobitidae, Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, pp. 432, 435 ; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 232 ; Henderson, Challenger Anomura, 1888, p. 49 ; Stebbing, Hist. Crust., 1893, p. 155 ; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1146 ; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 138.

Genus *Birgus* Leach.

Birgus, Leach, (Trans. Linn. Soc., XI, 1815, p. 337) ; Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 244 ; de Hann, Faun. Japon., Crust., 1849, p. 203 ; Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 435 ; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 232 ; Henderson, Challenger Anomura, 1888, p. 49 ; Stebbing, Hist. Crust., 1893, p. 156 ; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1147 ; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 148.

Birgus latro (Linné).

Cancer latro, Linné, Syst. Nat., ed. 12, II, 1767, p. 1049.

Birgus latro, Leach, (Trans. Linn. Soc. XI, 1815, p. 337); Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 246; de Haan, Faun. Japon., Crust., 1849, p. 212; Dana, U. S. Expl. Exp., Crust., pt. I, 1852, p. 474, pl. xxx, fig. 5; Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 100; Brocchi, Ann. Sci. Nat., Zool., 6e sér., II, 1875, Art. 2, p. 39, pl. xv, fig. 44; Suhm, Zeits. f. wiss. Zool., XXVI, 1875, p. 73; Semper, Zeits. f. wiss. Zool., XXX, 1878, p. 282; Miers, Zool. "Alert," 1884, p. 555; Bourne, P. Z. S., 1886, p. 334; Henderson, Challenger Anomura, 1888, p. 50; de Man, Arch. f. Nat., LIII, i, 1887, p. 453; and Abh. Senck. Ges., 1902, p. 751; Tashiro, Zool. Mag., I, 1889, p. 76 (in Japanese), pl. iii; Ortmann, Zool. Jahrb., Sys., VI, 1892, p. 319; and in Bronn's Thierreich, Malacostraca, p. 1235; Stebbing, Hist. Crust., 1893, p. 156; Whitelegge, Mem. Austral. Mus., III, 1897, p. 140; Borradaile, P. Z. S., 1898, p. 458; and 1899, p. 937; and Stom. and Mac. Willey's Exp., 1899, pp. 397, 426; and 1900, pp. 585-590; Alcock, Cat. Ind. Dec. Crust., 2, fasc. 1, 1905, p. 150, pl. xvi.

Birgus laticauda, Latreille, (Desmarest Dict. Sci. Nat., XXVIII, 1823, p. 290).

Note: A female from Yayeyama, Loo-choos, in the Sci. Coll. Mus.

Genus *Cænobita* Latreille.

Cænobita, Latreille, (Fam. Nat. du Règne Anim., 1826, p. 276); Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 238; de Haan, Faun. Japon., Crust., 1849, p. 203; Dana, U. S. Expl. Exp., Crust., pt. I, 1852, p. 435; Stimpson, Proc. Acad., Nat. Sci. Philad., 1858, p. 232; Hilgendorf, in v. d. Decken's Reisen Ost-Afr., Crust., III, i, 1869, p. 97; Henderson, Challenger Anomura, 1888, p. 50; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 315; and in Bronn's Thierreich, Malacos-

traca, p. 1146; Stebbing, Hist. Crust., 1893, p. 159; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 139.

Cænobita cavipes Stimpson.

Cænobita cavipes, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 245; and Smiths. Misc. Coll., XLIX, 1907, p. 200; de Man, Abh. Senckenb. Nat. Ges., XXIV, 1902, p. 743, pl. xxiv, fig. 46; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 146, pl. xiv, fig. 1.

C. violascens, Heller, (Verh. zool. bot. Ges. Wien, XII, 1862, p. 524); and Novara Crust., 1865, p. 82, pl. viii, fig. 1; Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 99, pl. vi, fig. 3b; de Man, Arch. f. Nat., LIII, 1887, i, p. 453; and Journ. Linn. Soc. Zool., XXII, 1888, p. 255.

C. compressa, Miers, Ann. Mag. Nat. Hist., ser. 5, v, 1880, p. 371.

C. compressus, Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 318, pl. xii, fig. 23; Henderson, Trans. Linn. Soc., Zool., v, 1893, p. 410; Borradaile, Stomatop. and Macr. Willey's Exp., 1899, pp. 396, 397, 198, 425; Lanchester, P. Z. S., 1902, II, p. 368.

Note: This species may be only a varietal form of *C. rugosus*. But no specimen on hand stands quite in harmony with Stimpson's description of that species. Therefore, it had better be placed distinct from it until a larger supply of materials makes possible a thorough revision of these Coenobite forms.

Cænobita hilgendorfi, n. nom.

Cænobita clypeata, Latreille, (Fam. Nat. Règne Anim., 1826, p. 277); Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 239; Dana, U. S. Expl. Exp. Crust., pt. 1, 1852, p. 473, pl. xxx, fig. 4; Heller, Novara Crust., 1865, p. 82; Miers, Ann. Mag. Nat., ser. 5, v, 1880, p. 371; Henderson, Challenger Anomura, 1888, p. 51.

C. clypeatus, Hilgendorf, in v. d. Decken's Reisen in Ost-Afr., III, i, 1869, p. 98, pl. vi, fig. 3c, 4a; de Man, Arch. f. Nat., LIII, i, 1887, p. 452; and Abh. Senckenb. Nat. Ges., XXV, 1902, p. 741,

pl. xxiv, fig. 44; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 316, pl. xii, fig. 20; Borradaile, P. Z. S., 1898, p. 459; and Stom. and Mac. Willey's Exp., 1899, p. 425; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 142, pl. xv, fig. 1, 1a.

Note: Five males and six females from Botel Tobago Island, Formosa, preserved in the Sci. Coll. Mus.

On Hilgendorf's authority (l. c.), we learn that *Cancer clypeatus* Herbst (1794) is not identical with Latreille's *Cænobita clypeata* (1826) but is the same as *Cænobita diogenes* M.-Edw. (1837). It then follows that the proper designation for the last mentioned species should be *Cænobita clypeatus* (Herbst). Since, now, this *C. clypeatus* (Herbst) is clearly a species distinct from *C. clypeata* Latr., the latter must receive a new specific name. Consequently I have proposed to call it *Cænobita hilgendorfi*.

Cænobita rugosus Milne-Edwards.

Cænobita rugosa, Milne-Edwards, Hist. Nat. Crust., II, 1837, p. 241; Krauss, Südafr. Crust., 1843, p. 212; Dana, U. S. Expl. Exp., Crust., pt. 1, 1852, p. 471, pl. xxx, fig. 1; Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 245; and Smiths. Misc. Coll., XLIX, 1907, p. 199; Heller, Novara Crust., 1865, p. 82; Henderson, Challenger Anomura, 1888, p. 51; and Trans. Linn. Soc., Zool., v, 1893, p. 410.

C. rugosus, Hilgendorf, in v. d. Decken's Reisen Ost-Afr., III, i, 1869, p. 99, pl. vi, fig. 2, 3a, 4b; Miers, Ann. Mag. Nat. Hist., ser. 5, II, 1878, p. 410; de Man, Arch. f. Nat., LIII, i, 1887, p. 452; Ortmann, Zool. Jahrb., Syst., VI, 1892, p. 317, pl. xii, fig. 22; Borradaile, P. Z. S., 1898, p. 460; and Stom. and Mac. Willey's Exp., pp. 397, 425; Lanchester, P. Z. S. 1902, II, p. 368; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 143, pl. xiv, fig. 3, 3a.

C. compressa var. *rugosa*, Bouvier, $\frac{2}{2}$ (Bull. Soc. Philom., 8e sér., III, 1890-91, p. 21).

C. clypeata, Owen, (Zool. "Blossom," Crust., 1839, p. 85, pl. xxv, fig. 3).

C. compressus, de Man, Abh. Senckenb. Nat. Ges., XXV, 1902, p. 742, pl. xxiv, fig. 45.

C. purpurea, Stimpson, Proc. Acad. Nat. Sci. Philad., 1858, p. 245; and Smiths. Misc. Coll., XLIX, 1907, p. 198.

Note: In the Sci. Coll. Mus. there are of this species: a male from Ôshima, Prov. Idzu, and several specimens from Bonin Islands, Loo-choos, and from Tansui in Formosa. A male specimen exists also in Mr. M. Nakamura's collection made in the Niigata Prefecture but there is ground to assume that the specimen was not captured at that locality, but was brought over from a warmer region. The presence or absence of an oblique file on the outer surface of left chela can not be much relied upon as an important specific character, for I find that in some individuals it is not at all or but so very little developed as to be scarcely distinguishable as such. The outer surface of the propodus and dactylus of the third left leg is sometimes simply rounded; in other cases it shows a longitudinal edge which is generally ill-defined but may sometimes be sharply defined. The coxal elongation of the fifth pair of legs is in no case so elongate as has been figured by authors (f. i., by Alcock, op. cit., pl. xiv, fig. 2a), and that even in those individuals which come close to *C. perlatus*. Although the material at my disposal does not suffice to form a complete connecting series between *C. rugosus* and *C. perlatus*, yet I am greatly inclined to think from a consideration of the above mentioned facts that some day it may become necessary to unite these species into one.

Family **Pylochelidae** Spence Bate.

Pylochelidae, Spence Bate, Challenger Macrura, 1888, p. 11; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1144; Alcock, Investigator Mac. and Anom., 1899, p. 209; and Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 13.

Genus **Pomatocheles** Miers.

Pomatocheles, Miers, P. Z. S., 1879, p. 49; Alcock, Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 14.

Pomatocheles jeffreysii Miers.

Pomatocheles jeffreysii, Miers, P. Z. S., 1879, p. 49, pl. iii, fig. 2.

Note: Three females with eggs from Misaki in the Sci. Coll. Mus.

Genus **Pylocheles** Milne-Edwards.

Pylocheles, Milne-Edwards, Bull. Mus. Comp. Zool. Harvard, VIII, 1880, p. 38; Milne-Edwards et Souvier, Mem. Mus. Comp. Zool. Harvard, XIV, no. 3, 1893, p. 17; Stebbing, Hist. Crust., 1893,

p. 169; Ortmann, in Bronn's Thierreich, Malacostraca, p. 1144; Alcock, Investigator Mac. and Anom., 1899, p. 209; also in Cat. Ind. Dec. Crust., pt. 2, fasc. 1, 1905, p. 14.

***Pylocheles spinosus* Henderson.**

Pyloches spinosus, Henderson, Challenger Anomura, 1888, p. 101, pl. xi, fig. 1; Ortmann, Zool. Jahrb., Syst, vi, 1892, p. 274.

Note: No specimen has come under my examination.

Postscriptum.

The following species should be added to the above catalogue, though I have not been able to examine it myself.

***Eupagurus ortmanni* Balss.**

Eupagurus ortmanni, Balss, Zool. Anz., Bd. XXXVIII, 1911, p. 7.

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Die Cixiinen Japans.

Von

Prof. S. Matsumura, *Rigakuhakushi*.

Unter meinem Cixiinen Material habe ich 46 Arten gefunden, von welchen 2 Gattungen und 42 Arten neu sind und deren wissenschaftliche Diagnosen ich hier folgen lassen will. Die aufgefundenen Arten verteilen sich auf 10 Gattungen, namentlich, *Macrocixius* (n. g.), *Cixius*, *Kuvera*, *Betacixius* (n. g.), *Oliarus*, *Trirhacus*, *Brixia*, *Kirbyana*, *Mundopa* und *Barma*. Die Gattungen *Cixius* und *Oliarus* kommen in der ganzen Welt vor, also sind Kosmopoliten. Die fünf Gattungen—*Kuvera*, *Brixia*, *Kirbyana*, *Mundopa* und *Barma*—sind bis jetzt nur für Ost-Indien nachgewiesen, kommen aber nach meinem Befunde auch in Formosa vor. Weiter ist die Gattung *Kuvera* sonderbarerweise auch in Nordjapan sehr häufig zu Hause. Während *Macrocixius* dann und wann in Südjapan und Formosa angetroffen wird, beschränkt sich *Betacixius* so weit wie bekannt nur auf Mitteljapan, Formosa und Südchina.

Das benutzte Material wurde grösstenteils vom Verfasser selbst gesammelt. Doch wurde ein Teil desselben ihm zugestellt aus Okinawa Insel von Herrn K. Kuroiwa; aus Formosa von Herren T. Shiraki, M. Ishida und I. Nitobe; und aus Mitteljapan von Herren Y. Nawa und S. Iguchi. Allen den genannten Herren spreche ich hiermit meinen herzlichen Dank aus.

Macrocixius gen. n.

Der Form nach *Cixius* Latr. sehr ähnlich, unterscheidet sich jedoch wie folgt:

1. Scheitelrand sehr hoch, der in der Mitte des Scheitels sich befindliche Längskiel undeutlich oder sehr niedrig, am Ende mit

einem hohen und fast geraden Querkiele; am Stirngipfel verläuft auch ein gerader Querkiehl und bildet mit dem Scheitelquerkiehl eine breite Querfurche.

2. Gesicht schmal, in der Mitte etwas breiter, Stirn ausgehöhlt, der Mittelkiehl niedrig, sodass der Clypeus ovalförmig sich etwas erhebt.

3. Rostrum lang, die Mitte des Hinterleibs erreichend, das zweite Glied viel länger als das dritte.

4. Elytren fast wie beim *Cixius* nervirt, nur an der Spitze mit 2 gegabelten Endnerven; die sämtlichen Nerven ohne Körnchen. Der Gabelnerv des Clavus liegt ganz dicht am Rande.

Typus: *Macrocixius giganteus* Mats.

***Macrocixius giganteus* sp. n. (Fig. 1.)**

Castanienbraun. Scheitel fast so lang wie der Abstand zwischen den Augen, an den Seiten gelblich, Gesicht an den Seiten in der

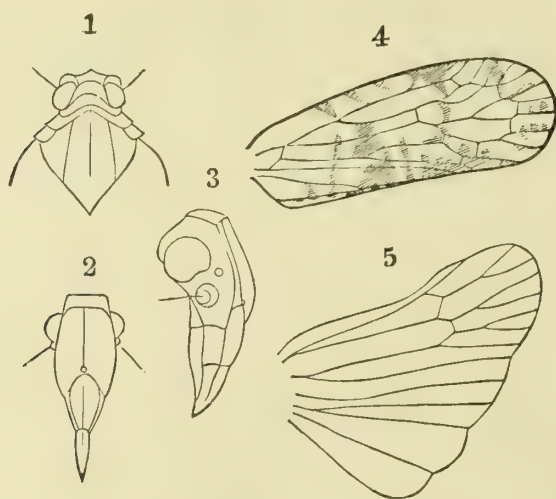


Fig. 1. *Macrocixius giganteus* sp. n.

1, Scheitel und Thorax. 2, Gesicht. 3, Dieselbe von der Seite.

4, Elytre. 5, Hinterflügel.

Mitte gelblich gefleckt. Rostrum gelblich, an der Spitze bräunlich. Pronotum mit helleren Kielen. Mesonotum in der Scheibe ziemlich tief ausgehöhlt, beim ♀ gelblichbraun. Elytren hyalin, Nerven gelblich, hie und da bräunlich checkirt und behaart, Stigma und einige zerstreuten Fleckchen nahe der Spitze dunkel gefärbt, beim ♀ einige zerstreute Fleckchen nahe der Mitte des Coriums und 3 Fleckchen im Costalfelde bräunlich. Unterseite castanienbraun, beim ♀ etwas heller, Hinterbrust gelblich. Beine bräunlich, Tibien und Tarsen gelblich, die ersteren mit zwei bräunlichen Flecken, die letzteren je an der Spitze etwas verbräunt.

♂ Genitalsegment compremirt, lang, unten rundlich tief ausgebuchtet, in der unteren Ausbuchtung mit einem dreieckigen Fortsatze; Griffel an der Basis schmal, zusammen eine Ellipse umschliessend, an der Spitze beilförmig stark erweitert.

♀ mit Bauchsegment 5 tief und fast rechtwinkelig ausgerandet.

Länge: ♂ 9 mm., ♀ 11 mm.

Hab.: Kiushu (Kagoshima); 3 (1 ♂, 2 ♀) Exemplare gesammelt vom Verfasser.

Cixius Latr.

Hist. Nat. Ins. XII, P. 310 (1803-4).

1. *Cixius nervosus* L.

Cicada nervosa L. F. S. P. 882 (1761).

Hab.: Sachalin, Hokkaido (Sapporo), nicht häufig. Sonstige Fundorte: Europa und Nordafrika.

2. *Cixius bicolor* sp. n.

♂ Dunkelbraun. Scheitel fast so lang wie breit, Seitenkiele hoch und je in der Mitte blassgelblich gefleckt, der hintere winkelige Querkel nach vorn gebogen, fast parallel mit dem vorderen Quer-

kiele, das vordere Grübchen durch den Längskiel nicht getrennt. Gesicht gelblich, Stirnthälchen bräunlich. Pronotum und Deckschuppen gelblich, das erste in der Mitte bräunlich gefärbt. Elytren subhyalin, weisslich getrübt, Nerven weisslich, bräunlich gekörnelt und spärlich behaart; beim ♂ nahe der Wurzel mit 2 bräunlichen Querbinden, beim ♀ die Basalhälfte bräunlich, bei einem ♂ Exemplare auch die Basalhälfte bräunlich, der Spitzendrittel der Elytren dunkelbräunlich gefleckt, nahe der Spitze eine undeutliche, bräunliche Querbinde, fast in der Mitte am Costalrande ein dunkles Fleckchen, Stigma dunkelbraun. Brust und Beine gelblich, Bauch dunkel.

♂ Genitalien gelblich, in der unteren Ausbuchtung ein dreieckiger Fortsatz, Griffel an der Basis schmal, zusammen ein Oval umschliessend, am Ende rundlich breit erweitert.

♀ mit Bauchsegment 6 am Hinterrande bogig ausgerandet.

Länge: ♂ 6 mm., ♀ 6.5 mm.

Hab.: Formosa (Horisha, Rinkihō); gesammelt in 5 (3 ♂, 2 ♀) Exemplaren vom Verfasser.

3. *Cixius arisanus* sp. n.

Hellbräunlichgelb. Scheitel, Gesicht, Rostrum, Deckschuppen und Pronotum etwas heller gefärbt, die sämtlichen Längskiele an den äussersten Rändern bräunlich; der winkelige Querkiel des Scheitels vorn abgerundet, fast parallel mit dem vorderen Kiele; Gesicht an jeder Seite gelblich gefleckt, Rostrum an der Spitze kaum verbräunt. Elytren subhyalin, gelblich getrübt, Nerven blassgelblich, gelbbraunlich fein gekörnelt, mit zahlreichen, langen, dunkelbräunlichen Härchen; Körnchen am Costalrande etwas feiner als auf den Nerven; eine wellenartige bräunliche Querbinde zieht von der Mitte des Clavus an bis zum Costalnerven; im Costalfelde nahe der Mitte mit 3 bräunlichen Quersflecken, Clavus nahe der Basis mit einem bräunlichen Flecke, in der Mitte und nahe der Spitze unregelmässig bräunlich gefleckt; Quernerven, Bogenrand und Stigma bräunlich.

Unterseite und Beine gelblich, Bauch bräunlich, Segmentränder weisslichgelb.

♀ mit Bauchsegment 6 am Hinterrande flach ausgerandet.

Länge: ♀ 7 mm.

Hab.: Formosa (Tappan); gesammelt in einem ♀ Exemplare vom Verfasser.

Der Zeichnung nach *C. brachycranus* Fieb. etwas ähnlich.

4. *Cixius ibukisanus* sp. n.

Scheitel und Gesicht gelblich, die hinteren Scheitelgrübchen dunkelbräunlich, die vorderen Grübchen ohne Längskiel, die Kiele gelblich, nur die Seitenkiele des Scheitels an den äussersten Rändern bräunlich. Wangen bräunlich. Pronotum und Deckschuppen blassgelblich. Mesonotum gelblichbraun, am Vorder- und Hinterrande dunkelbraun. Elytren subhyalin, gelblich getrübt, die Nerven gelblich, bräunlich gekörnelt, die Körnchen auf der Basalhälfte etwas grösser als auf der Apicalhälfte, am Costalrande in der Mitte mit 3 dunklen, fast gleich entfernten Fleckchen, von deren mittlere Flecke an bis zur Clavusmitte eine undeutliche, bräunliche Querbinde hinzieht. Clavus nahe der Basis und am Rande nahe der Mitte je mit einem bräunlichen Fleckchen, Apicalfeld hie und da undeutlich bräunlich gefleckt, Stigma gelblichbraun, bräunlich gekörnelt. Unterseite und Beine gelblich, nur die Vorderbrust und der Bauch castanienbraun.

♀ mit Bauchsegment 5 breit rundlich ausgebuchtet, Bauchsegment 6 am Hinterrande flach ausgerandet, weisslich gesäumt.

Länge: ♀ 7.5 mm.

Hab.: Honshu (Berg Ibuki); 1 ♀ Exemplare gesammelt von Herrn Y. Nawa.

Der Zeichnung nach etwas *C. brachycranus* Fieb. ähnlich.

5. *Cixius tappanus* sp. n.

Hellbräunlichgelb. Scheitel etwas 5-eckig, vorn stumpfwinkelig, die vorderen Scheitelgrübchen dreieckig; die seitlichen Scheitellkiele in der Mitte mit einem blassgelblichen Fleckchen; Rostrum an der Spitze bräunlich; Wangen oberhalb der Augen und das Pronotum an den Seiten pechbraun; Pronotum schmutziggelb. Elytren hyalin, ein wenig gelblich getrübt, Nerven gelblich, bräunlich gekörnelt, mit langen, bräunlichen Härchen; die Körnchen nahe der Basis des Costalrandes, und dieselbe am Clavusrande deutlich grösser als auf den Nerven; die Costalbasis und ein Längsstrich an der Basis des Clavus dunkelbraun; Stigma bräunlich, in der Mitte mit einem dunklen Striche, äusserlich gelblich gerandet, fein behaart; ein Fleck nahe der Mitte des Costalfeldes, ein Fleck an der Innenseite des Stigma und 5 etwa pfeilförmige Flecke in jeder Apicalzelle dunkelbraun, Endnerven je an der Spitze dunkel gefleckt. Unterseite und Beine gelblich, letztes Bauchsegment dunkelbraun.

♂ In der unteren Ausbuchtung des Genitalsegments mit einem zapfenförmigen Fortsatze, die seitlichen Lappen gelblich, Griffel nahe der Basis eine Ellipse umschliessend, am Ende breit rundlich erweitert; Afterröhre an der Spitze jederseits mit einem stumpfen Fortsatze.

Länge: ♂ 7 mm.

Hab.: Formosa (Tappan); gesammelt in 4 ♂ Exemplare vom Verfasser.

6. *Cixius kuyanianus* sp. n.

Hellbräunlichgelb. Der Hinterquerkiel des Scheitels flach abgerundet, mit dem Vorderkiel fast parallel, Hintergrübchen etwas halb so lang wie der Abstand zwischen den Augen. Clypeus an der Spitze jederseits bräunlich gefleckt. Scheitel, Rostrum, Pronotum und Deckschuppen blassgelblich, Rostrum an der Spitze kaum verbräunt. Mesonotum an den Seiten bräunlich, an der Spitze querrunzelig.

Elytren subhyalin, schmutziggelb getrübt, Nerven blassgelblich, bräunlich fein gekörnelt, bräunlich mässig behaart, nahe der Mitte mit einer den Clavus nicht erreichenden, bräunlichen Schrägsbinde, Costalrand in der Mitte mit 3 dunklen Fieckchen; Clavus nahe der Basis und in der Mitte am Rande je mit einem bräunlichen Flecke, in der Mitte des Coriums und an der Spitze je mit 2 bräunlichen Flecken, Stigma fast von der Grundfarbe, fein gekörnelt und behaart.

Unterseite und Beine gelblich, Schenkel mehr oder wenig verbräunt, an den Spitzen gelblich; Bauch beim ♂ dunkelbraun, beim ♀ gelblichrot, die Segmentränder des Conexivums beim ♂ karminrot.

♂ In der unteren Ausbuchtung des Genitalsegments mit einem breiten dreieckigen Fortsatze, Griffel an der Basis ein Oval umschliessend, am Ende je fast breit beilförmig erweitert, Afterröhre gelblich, am Unterrande abgerundet.

♀ Bauchsegment 6 breit rundlich ausgebuchtet.

Länge: ♂ 5.5 mm., ♀ 6.5 mm.

Hab.: Formosa (Tappan); 5 (3 ♂, 2 ♀) Exemplare gesammelt vom Verfasser.

Der Form und Färbung nach *C. tappanus* etwas ähnlich.

7. *Cixius hachijonis* sp. n.

Bräunlichgelb. Scheitel und Gesicht gelblich, die Kiele an den äussersten Rändern bräunlich. Antennen weisslich. Pronotum gelblich. Elytren subhyalin, gelblich getrübt, Nerven gelblich, sehr fein bräunlich gekörnelt, die Körnchen an der Costa deutlich feiner als auf den Nerven; im Costalfelde in der Mitte mit 3 bräunlichen, fast gleich entfernten Fleckchen, Corium nahe der Mitte mit einem fast rechtwinkelig gebrochenen, bräunlichen Querfleck, Apicalquernerven bräunlich gesäumt, Stigma gelblich, fein gekörnelt. Unterseite und Beine blassgelblich, Rostrum an der Spitze kaum verbräunt.

♀ Legescheide bräunlich, Bauchsegment 5 rundlich ausgebuchtet, flach ausgerandet.

Länge: ♀ 5.5 mm.

Hab.: Hachijo Insel; ein ♀ Exemplar gesammelt vom Verfasser.

Der Form nach *C. cingulatus* m. etwas ähnlich, aber die Decknerven viel feiner gekörnelt.

8. *Cixius kommonis* sp. n.

Gelblichbraun. Scheitel deutlich kürzer als der Abstand zwischen den Augen, der hintere Querkiel nach vorn gebogen und fast parallel mit dem vorderen Kiele, die vorderen und hinteren Grübchen gleich lang, der Längskiel des vorderen Grübchen undeutlich; die Kiele des Gesichtes gelblich. Pronotum am hinteren Rande schmutziggelb. Mesonotum hellbräunlichgelb, an den Seiten bräunlich, an der Spitze querrunzelig. Elytren subhyalin, weisslich getrübt, Nerven subhyalin, weisslich, mit bräunlichen Körnchen und langen bräunlichen Härchen besetzt, Körnchen an der Costalbasis und am Clavus deutlich grösser als diejenigen auf den Nerven; Costalfeld mit 3 bräunlichen Fleckchen, welche am Costalrande dunkler gefärbt sind. Basis, Clavus, Corium und Apicalfeld meistens bandartig bräunlich gefleckt, Stigma und das Spitzenfeld am unteren Rande bräunlich. Rostrum gelblich, das dritte Glied verbräunt. Brust und Beine vorwiegend schmutziggelb, Vorderbrust an den Seiten bräunlich, Schenkel verbräunt, an den Spitzen blassgelblich; Bauch dunkelbraun.

♂ In der unteren Ausbuchtung mit einem rundlichen Fortsatze, Griffel an der Basis cylindrisch, zusammen eine Ellipse unschliessend, am Ende breit rundlich erweitert und von schmutziggelber Färbung.

Länge: ♂ 5 mm.

Hab.: Formosa (Kammon bei Horisha); 1 ♂ Exemplar gesammelt von Herrn I. Nitobe.

Der Form und Zeichnung nach *C. simplex* H. S. etwas ähnlich.

9. *Cixius suturalis* sp. n.

Dunkelbraun. Scheitel, Gesicht, Pronotum und Deckschuppen gelblich, Scheitel deutlich kürzer als der Abstand zwischen den Augen, der hintere Querkiehl nach vorn weit gebogen, der Längskiehl des vorderen Grübchen unvollständig. Rostrum an der Spitze kaum verbräunt. Pronotum am Hinterrande tief spitzwinkelig ausgebuchtet. Mesonotum an den Seiten hellbräunlichgelb. Elytren subhyalin, gelblich getrübt, Nerven blassgelblich, bräunlich fein gekörnelt, spärlich behaart, am Costalfelde mit 3 undeutlichen, bräunlichen Quersflecken, welche am Costalrande dunkler gefärbt sind; im Analwinkel läuft eine bräunliche Marginalbinde, welche bis zur Mitte des Clavus erreicht; Stigma bräunlich, Apicalzellen je undeutlich bräunlich gefleckt. Brust und Beine gelblich, Bauch dunkelbraun.

♀ Letztes Bauchsegment am Hinterrande gerade, Legescheide gelblich, die seitlichen Kiele bräunlich.

Länge: ♀ 6 mm.

Hab.: Formosa (Kammon bei Horisha); gesammelt in einem ♀ Exemplare von Herrn I. Nitobe.

Der Form nach *C. kammonis* m. etwas ähnlich, unterscheidet sich aber durch die feiner gekörnelt und viel weniger behaarten Decknerven.

10. *Cixius nitobei* sp. n.

Hellbräunlichgelb. Scheitel, Gesicht, Rostrum, Deckschuppen und Pronotum gelblich, die Längskiele an den äussersten Rändern bräunlich. Elytren subhyalin, gelblich getrübt, Nerven blassgelblich, Quer- und Subapicalnerven hie und da bräunlich getrübt, sehr fein bräunlich gekörnelt, die Körnchen an der Costa deutlich feiner als auf den Nerven; Stigma hellbräunlich, mit zahlreichen, feinen Körnchen. Unterseite und Beine gelblich, Klauen an der Basis dunkelbraun.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem kleinen, stumpfwinkligen Fortsatz, Griffel schmal, flach, an der Basis zusammen eine schmale Ellipse umschliessend, je am Ende fast pflugscharförmig erweitert, an der Spitze schmal abgerundet.

Länge: ♂ 6 mm.

Hab.: Formosa (Berg Arisan); 1 ♂ Exemplar gesammelt von Herrn I. Nitobe.

Der Form und Zeichnung nach *C. nawae* m. ähnlich.

11. *Cixius nawae* sp. n.

Hellbräunlichgelb. Scheitel, Gesicht, Rostrum, Pronotum, und Deckschuppen gelblich, die Längskiele an den äussersten Rändern bräunlich. Elytren subhyalin, bräunlich getrübt, Nerven gelblich, bräunlich fein gekörnelt, Stigma etwas tiefer in der Färbung, mit etwa 9 Körnchen, vorn deutlich heller gefärbt; am Spitzenfelde etwas verdunkelt. Unterseite und Bauch gelblich, Bauch dunkelbräunlich, Genitalien gelblich.

♂ In der unteren Ausbuchtung mit einem kleinen, oblongen Fortsatze, Griffel an der Basis schmal, zusammen ein Oval umschliessend, am Ende breit quadratisch erweitert, an der Spitze abgerundet.

Länge: ♂ 5.7 mm.

Hab.: Honshu (Berg Ibuki); 1 ♂ Exemplar gesammelt von Herrn Y. Nawa.

Der Form Färbung nach *C. cingulatus* m. etwas ähnlich.

12. *Cixius towadensis* sp. n.

Der Form und Färbung nach *C. nawae* m. sehr ähnlich, aber unterscheidet sich wie folgendes:

Scheitel deutlich breiter, Gesicht in der Mitte an den Seiten nicht gelblich gefleckt. Der Mittelkiel des Mesonotums deutlich schmaler und niedriger. Elytren viel heller, Körnchen viel kleiner, Nerven und Körnchen gelblich. Bauch beim ♀ ganz gelblich.

♂ Der Fortsatz in der unteren Ausbuchtung des Genitalsegmentes sehr niedrig, kaum sichtbar.

♀ Bauchsegment 5 tief rundlich ausgebuchtet. Legescheide hellbräunlich, an der Basis gelblich, blassgelblich fein-behaart.

Länge: ♂ 5.5—♀ 6 mm.

Hab.: Honshu (Hakone und Towada bei Aomori); 2 (1 ♂, 1 ♀)

Exemplare gesammelt vom Verfasser.

13. *Cixius cingulatus* sp. n.

Scheitel und Gesicht gelblich, Kiele an den äussersten Rändern bräunlich. Pronotum schmutziggelb, Mesonotum castanienbraun, der Mittelkiel etwas heller. Elytren subhyalin, gelblich getrübt, an der Spitze etwas verbräunt, Nerven blassgelblich, bräunlich gekörnelt, ohne Härchen, Apicalquernerven bräunlich gesäumt, Apicalnerven je an der Spitze bräunlich; die Körnchen an der Costa viel feiner als auf den Nerven des Corium und des Clavus, Punkte am Bogenrande auch feiner. Unterseite und Beine gelblich, Bauch castanienbraun.

♂ Bauchsegment 5 rundlich ausgebuchtet, 6 flach ausgerandet; Segmentränder weisslich gerandet.

Länge: ♀ 6 mm.

Hab.: Hachijo Insel; gesammelt in einem ♀ Exemplare vom Verfasser.

14. *Cixius velox* sp. n.

♀ Gelbbräunlich. Scheitel so lang wie der Abstand zwischen den Augen, der hintere Querkie nach vorn konisch gebogen, der Längskiel der vorderen Grübchen undeutlich. Die Längskiele des Gesichtes an den äussersten Rändern bräunlich. Elytren subhyalin, gelblich getrübt, Nerven gelblich, ziemlich stark bräunlich gekörnelt; nahe der Mitte mit 3 bräunlichen Querfleckchen, von welchen der eins sich nahe der Mitte des Clavus befindet; Apicalquernerven und

Bogenrand bräunlich. Rostrum an der äussersten Spitze bräunlich. Hinterbrust blassgelblich, Bauch dunkelbraun, Beine schmutziggelb.

♀ Bauchsegment 6 am Hinterrande fast gerade, weisslich gerandet.

Länge: ♀ 47 mm.

Hab.: Formosa (Tappan); gesammelt in einem ♀ Exemplare vom Verfasser.

Diese Art zeichnet sich durch die stark bräunlich gekörnelten Decknerven aus.

15. *Cixius hakonensis* sp. n.

Schwarz. Scheitel, Gesicht, Rostrum, Deckschuppen und Pronotum gelblich, Hintergrübchen des Scheitels dunkel ausgefüllt und längsrunzelig. Clypeus an der Spitze seitlich dunkelbraun, Rostrum an der Spitze etwas verbräunt. Mesonotum an den Seiten gelblich gefleckt. Elytren subhyalin, schmutziggelb getrübt, Nerven gelblich, fein bräunlich gekörnt, spärlich dunkel behaart, am Costalrande mit 3 schwärzlichen Fleckchen, Quernerven bräunlich, Apicalzellen und die Costalzelle an der Basis je der Länge nach bräunlich ausgefüllt, vor dem Stigma heller gefärbt, Clavus in der Mitte und an der Spitze je am Rande bräunlich gefleckt. Unterseite dunkelbraun, Mittel- und Hinterbrust gelblich, Bauch in der Mitte der Länge nach gelblich. Beine gelblich.

♂ Genitalsegment in der unteren Ausbuchtung mit einem schmal zapfenförmigen Fortsatze, Griffel gelblich, an der Basis zusammen ein Oval umschliessend, am Ende ohrförmig erweitert, Asterröhre lang, an der Spitze am unteren Rande flach ausgebuchtet.

Länge: ♂ 6 mm.

Hab.: Honshu (Hakone); gesammelt in einem ♂ Exemplare.

Der Form und Zeichnung nach *C. cingulatus* etwas ähnlich.

16. *Cixius centralis* sp. n.

Hellbräunlichgelb. Scheitel, Gesicht, Rostrum, Deckschuppen und Pronotum gelblich, die Längskiele an den äussersten Rändern bräunlich, der hintere Querkie des Scheitels vorn stumpfwinkelig, Wangen und der Clypeus an den Seiten bräunlich. Mesonotum in der Mitte der Länge nach bräunlich. Elytren subhyalin, am Basal- und Apicaldrittel verbräunt, in der Mitte gelblich getrübt, Nerven von der Grundfarbe, fein dunkel gekörnelt, ohne Härchen. Brust und Beine gelblich, Bauch bräunlich.

♀ Legescheide schwarz, an der Wurzel gelblich, Bauchsegment 6 am Hinterrande schwach ausgerundet.

Länge: ♀ 6 mm.

Hab.: Honshu (Aomori); ein ♀ Exemplar gesammelt vom Herrn I. Nitobe.

Der Form und Zeichnung nach *C. hachijonis* m. ähnlich.

17. *Cixius pilosellus* sp. n.

Der Form und Zeichnung nach *C. nitobei* sehr ähnlich, unterscheidet sich aber wie folgt:

Körper deutlich kleiner, weisslich tomentiert. Scheitel vorn spitzwinkelig gekielt, Hintergrübchen deutlich seichter, so dass der Längskiel höher auftritt. Elytren deutlich dichter punctirt, mit zahlreichen, langen, gelblichen Härchen, Quernerven breiter bräunlich umsäumt, die Mitte und Spitze des Clavus je am Rande bräunlich gefleckt.

♀ Bauchsegment 6 am Hinterrande flach ausgerandet.

Länge: ♀ 5.5 mm.

Hab.: Formosa (Koshun); 1 ♀ Exemplar gesammelt vom Verfasser.

18. *Cixius flavescens* sp. n.

Der Färbung und Zeichnung nach *C. hopponis* m. sehr ähnlich, unterscheidet sich aber wie folgt

Körper deutlich schmaler. Der winkelige Querkieel des Scheitels noch schmaler und niedriger, so dass der Mittelkieel des Scheitels deutlich stärker auftritt. Gesicht in der Mitte deutlich breiter. Die Nerven der Elytren viel dichter gekörnelt, ohne Härchen, Stigma und Bogenrand mit zahlreichen Körnchen, Apicalquernerven meistens bräunlich gesäumt. Rostrum an der Spitze kaum verbräunt.

♂ Ein Fortsatz in der unteren Ausbuchtung des Genitalsegmentes viel kürzer und schmaler, Griffel etwas pflugscharförmig, am Ende zugespitzt.

Länge: ♂ 4.5 mm.

Hab.: Formosa (Koshun); gesammelt in einem ♂ Exemplare vom Verfasser.

19. *Cixius hopponis* sp. n.

Hellbräunlichgelb. Die sämtlichen Kiele, das Pronotum ausgenommen, an den äussersten Rändern bräunlich. Elytren subhyalin, gelblich, die Nerven gelblich, bräunlichgelb gekörnelt, spärlich bräunlich lang-behaart, Stigma gelblich, spärlich gekörnelt, Unterseite und Beine gelblich, Rostrum an der Spitze bräunlich, Klauen dunkelbraun. Bauch rötlichgelb.

♂ In der unteren Ausbuchtung mit einem kurzen, spitzigen Fortsatze, Griffel je an der Basis nach aussen gebogen, zusammen eine schmale Ellipse umschliessend, an der Spitze beilförmig erweitert; der Unterrand der Afterröhre breit stumpfwinkelig ausgeschnitten.

Länge: ♂ 5 mm.

Hab.: Formosa (Hopponi); gesammelt in einem Exemplare vom Verfasser.

Trirhacus Fieb.

Rev. Mag. Zool. p. 165 (1876).

***Trirhacus iguchii* sp. n.**

Hellbräunlichgelb. Scheitel etwas länger als der Abstand zwischen den Augen, der hintere Querkiehl stumpfwinkelig, der Längskiehl des vorderen Grübchen deutlich, Gesicht gelblich, Rostrum lang, bis zum zweiten Bauchsegmente reichend, an der Spitze kaum verbräunt. Pronotum am Hinterrande weisslich. Mesonotum an der Spitze verbräunt. Elytren hyalin, weisslich etwas getrübt, Nerven weisslich, bräunlich gekörnelt, spärlich behaart, die Körnchen am Costalrande deutlich grösser als auf den Nerven; an der Basis bräunlich, in der Mitte 2 bräunliche Querbinden, vor dem Stigma auch eine bräunliche Querbinde, Stigma bräunlich, am Spitzenfelde bräunlich gefleckt. Brust und Beine vorwiegend hellbräunlichgelb, die Hinterbrust weisslich. Bauch bräunlich, in der Mitte weisslichgelb.

♀ Bauchsegment 6 am Hinterrande fast gerade, Legescheide gelblich.

Länge: ♀ 5.5 mm.

Hab. Kiushu (Nakatsu); gesammelt in einem ♀ Exemplare von Herrn S. Iguchi.

Der Form und Zeichnung nach *T. setulosus* Fieb. sehr ähnlich, aber etwas kleiner und die Körnchen der Decknerven viel weniger behaart.

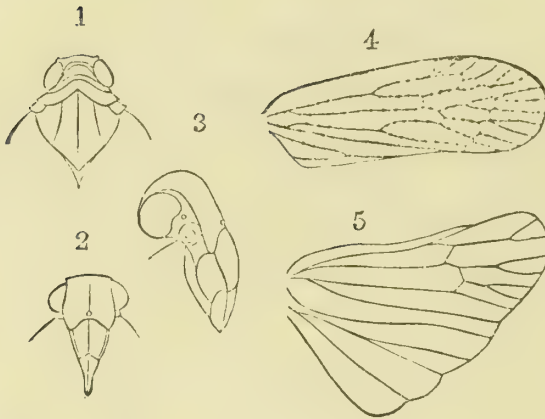
Kuvera Dist.

Faun. British Ind. Rhyn. Vol. III. p. 261 (1906).

1. *Kuvera flaviceps* Mats. (Fig. 2.)

Oliarus flaviceps Mats. Ent. Nach. 26, p. 208, ♀ (1900).

♂ Genitalien gelblich, in der unteren Ausbuchtung des Genitalsegmentes mit einem breit conischen Fortsatz, Griffel je von der Basis

Fig. 2. *Kuvera flaviceps* Mats.

1, Scheitel und Thorax. 2, Gesicht. 3, Dieselbe von der Seite.
4, Elytra. 5, Hinterflügel.

an breit, compremirt, zusammen ein oval umschliessend, am Ende breit querovalförmig erweitert.

Länge: ♂ 5.5–6.5 mm. ♀ 6–7 mm.

Hab.: Ganz Japan (überall häufig).

var. *curvata* n.

♀ Elytren an der Basis bräunlich, Stigma dunkelbraun, von der Innenseite des Stigma bis zur Clavusspitze zieht eine etwas nach innen gebogene, dunkle Querbinde, Clavus in der Mitte am Rande mit einem bräunlichen Längsstreifen; stark purpur irisierend.

Länge: ♀ 7 mm.

Hab.: Honshu (Kogota bei Sendai); gesammelt in einem ♀ Exemplare vom Verfasser.

var. *vittata* n.

♀ Von der Basis der Elytren bis über die Mitte zieht ein

breiter Längsstreif, welcher sich am Ende mit einem gebogenen, breiten, dunklen Flecke vereinigt; Clavus bräunlich, an der Naht glasshell.

Länge: ♀ 7 mm.

Hab.: Hokkaido (Sapporo); gesammelt in 3 ♀ Exemplaren vom Verfasser.

var. costalis n.

♀ Scheitelgrübchen mit einem dunklen Querfleck. Elytren ganz dunkelbraun, nur am Costalfelde glasshell, Clavus in der Mitte am Rande dunkel gefleckt.

Länge: ♀ 7 mm.

Hab.: Hokkaido (Sapporo); 4 ♀ Exemplare gesammelt vom Verfasser.

var. fumata n.

♀ Elytren ganz dunkelbraun, nur am Vorderrande des Stigmas weisslich gefleckt, am Apicaldrittel etwas dunkler.

Länge: ♀ 6.7 mm.

Hab.: Honshu (Towada bei Aomori); 1 ♀ Exemplar gesammelt vom Verfasser.

var. pallidula n.

Ganz gelblich, nur die Antennen und das Stigma dunkel, oft ein Fleckchen in der Mitte des Clavusrandes dunkel.

Länge: ♂ 5—♀ 6 mm.

Hab.: Hokkaido (Sapporo); gesammelt in zahlreichen Exemplaren vom Verfasser.

2. *Kuvera ligustri* sp. n.

Der Form nach dem kleineren Exemplare von *K. flaviceps* sehr ähnlich, unterscheidet sich aber wie folgt:

Gesicht schmaler, nur an den Seiten gelblich gerandet, der Mittelkiel deutlich kürzer und schmaler. Pronotum weiss, vor dem Bogenkiel ein schwarzer Quersfleck, Mesonotum am Vorderdrittel deutlich niedriger, an der Spitze nicht fein querrunzelig wie bei *flaviceps*. Tegulae weiss. Elytren subhyalin, bräunlichgelb getrübt, am Apicaldrittel angeraucht.

♂ Genitalien bräunlich, ein Fortsatz in der unteren Ausbuchtung deutlich kürzer und am Ende spitziger.

Länge: ♂ 5 mm., ♀ 5.5 mm.

Hab.: Honshu (Hakone); gesammelt in zahlreichen Exemplaren auf *Ligustrum ibota* vom Verfasser.

3. *Kuvera toroënsis* sp. n.

Schwarz. Scheitel, die Stirn an den Seiten, Rostrum, Pronotum und Deckschuppen gelblich, Scheitelgrübchen dunkel ausgefüllt. Elytren subhyalin, schmutziggelb getrübt, Nerven gelblich, sehr fein, fast gleichfarbig gekörnelt, Stigma dunkel. Unterseite und Beine dunkelbraun, die Schenkel je an der Spitze, die Tibien je in der Mitte und Hintertarsen gelblich.

♂ Genitalien gelblichbraun, Fortsatz in der unteren Ausbuchtung kurz, stumpfdreieckig, Griffel an der Basis schmal, compremirt, am Ende dunkelbraun, breit beilförmig erweitert.

♀ Legescheide gelblichbraun, Bauchsegment 5 tief breit-konisch ausgebuchtet.

Länge: ♂ 5.7 mm., ♀ 6.2 mm.

Hab.: Formosa (Toroen); 2 (1 ♂, 1 ♀) Exemplare gesammelt vom Verfasser.

4. *Kuvera tappanella* sp. n.

Schwarz. Scheitel, Stirngipfel und Stirnseiten gelblich, Pronotum in der Mitte am Hinterrande und die Deckschuppen schmutziggelb. Rostrum gelblich, an der Spitze dunkel. Mesonotum an der Spitze

fein querrunzelig. Elytren hyalin, gesprenkelt mit feinen weissen Pudern, Nerven gelblich, Körnchen kaum dunkler, mit spärlichen Härchen; Stigma dunkel und deutlich. Unterseite dunkelbräunlich, Beine hellgelblichbraun, Schenkel bräunlich.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem breiten, dreieckigen, gelblichen Fortsatz; Griffel gelblich, an der Basis schmal, compremirt, am Ende rundlich erweitert und an der Aussen-seite etwas aufwärts gekrümmt.

♀ Bauchsegment 5 tief rundlich ausgebuchtet, 6 am Hinterrande gerade, Legescheide dunkel, je am Innenrande hellbräunlich.

Länge: ♂ 5 mm., ♀ 6 mm.

Hab.; Formosa (Tappan und Toroen); gesammelt in zahlreichen Exemplaren vom Verfasser.

Der Form nach *K. flaviceps* m. etwas ähnlich.

5. *Kuvera longipennis* sp. n.

Hellbräunlichgelb. Vorderes Scheitelgrübchen ziemlich tief. Antennen dunkel, Stirn an den Seiten weisslich. Pronotum weisslich, nur an der hinteren Region des Auges bräunlich. Mesenotum an der Spitze etwas querrunzelig. Elytren fast mehr als zweimal so lang wie der Leib, hyalin; Nerven blassgelblich, mit sehr feinen Körnchen, je mit einem bräunlichen Härchen; Costa gelblich, an der Basis bräunlich, Stigma gelblichbraun, Spitzenfeld am Innenrande etwas verbräunt. Unterseite gelblich, Mesosternum und Coxen weisslich, Tarsen an der Spitze etwas verbräunt.

♀ Bauchsegment 5 breit conisch ausgebuchtet, 6 am Hinterrande gerade, Legescheide so lang wie der Hinterleib, gelblichbraun.

Länge: ♀ 7 mm.

Hab.: Formosa (Tappan); gesammelt in einem ♀ Exemplare vom Verfasser.

Betacixius gen. n.

Der Form nach *Kuvera* Dist. sehr ähnlich, unterscheidet sich aber wie folgt:

Scheitel deutlich kürzer, vorn abgerundet und ganz ohne das vordere Grübchen; Mittelkiel der Stirn nur an der Basis schwach sichtbar, Seitenkiele nur von der Mitte bis zur Basis deutlich, Clypeusnaht deutlich seichter ausgebogen. Scheitel am Hinterrande und Pronotum am Vorderrande schwächer ausgerandet, Mesonotum meistens hoch gewölbt, mit 3 schwachen Längskieln. Elytren mit viel feineren Nerven, Körnchen auch feiner, mit 5 Antapicalzellen. Die erste und zweite Längsnerven des Flügels gegabelt, während bei *Kuvera* die zweite und dritte gegabelt sind.

Typus: *Betacixius ocellatus* Mats.

1. *Betacixius ocellatus* sp. n. (Fig. 3).

Schwarz. Scheitel und Gesicht gelblichbraun, in der Mitte an den Seiten weisslichgelb gefleckt, Clypeus an der Spitzenhälfte, die

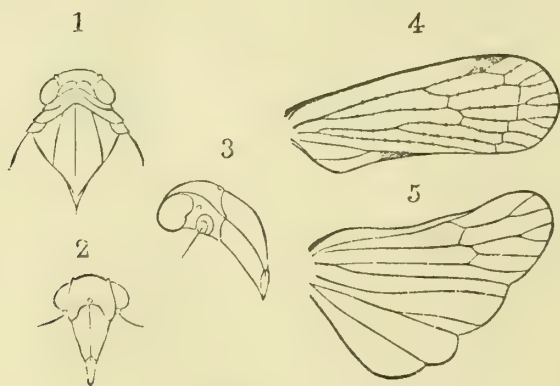


Fig. 3. *Betacixius ocellatus* sp. n.

1, Scheitel und Thorax. 2, Gesicht. 3, Dieselbe von der Seite.
4, Elytre. 5, Hinterflügel.

äusserste weissgelbliche Spitze ausgenommen, schwarz; Antennen gelblich, dunkel gefleckt, Umgebung der Ocelle weisslichgelb, Rostrum gelb, an der Spitze kaum verbräunt. Deckschuppen und das Pronotum an den Seiten weisslichgelb, die Kiele gelblich. Mesonotum an der Spitze gelblich, fein querrunzelig. Elytren hyalin, schwach gelblich getrübt, Nerven und Körnchen gelblich, gelblich behaart, an der Spitze mit einem grossen, oblongen, schwarzen Ringsfleck, in der Mitte des Clavus mit einem schwarzen Querfleck, von welchem bis zur Clavusspitze den Rand entlang ein schwarzer Längsfleck zieht, an der Basis auch etwas verbräunt. Unterseite dunkelbraun, Metasternum gelblich. Beine gelblich, Vorderbeine schwarz, nur die beiden Enden der Schenkel und die Coxen sowie auch Trochanter weisslich, Mitteltibien mit einem schwarzen Längsstreifen, die Tarsen dunkelbraun.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem kurz-dreieckigen, gelblichen Fortsatz, Griffel gelblich, zusammen an der Basis einen breiten Kegel umschliessend, am Ende breit erweitert und an der aussen Seite etwas nach oben gekrümmt.

♀ Bauchsegment 5 tief rundlich ausgebuchtet, 6 in der Mitte gelblich, am Hinterrande gerade, Legescheide dunkelbraun, gelblich lang-behaart, stark aufwärts gebogen, Scheidenpolster kurz.

Länge: ♂ 6 mm., ♀ 7 mm.

Hab.: Formosa (Hoppon, Horisha); gesammelt in 4 (1 ♂, 3 ♀) Exemplaren vom Verfasser.

2. *Betacixius tonkinensis* sp. n.

Der Zeichnung nach *B. ocellatus* m. sehr ähnlich, unterscheidet sich aber wie folgendes:

1. ♂ Körper viel kleiner.
2. Scheitel und Pronotum vorwiegend blassgelblich.
3. Elytren nahe der Mitte mit einer bräunlichen Querbinde, welche den Costalrand nicht ganz erreicht; Apicalringsfleck

fast rundlich, Stigma deutlich tiefer in der Färbung.

4. Mittel- und Hinterschenkel verbräunt, Längsstreifen der Mitteltibien schwächer.

5. Beim ♀ Bauch ganz gelb.

Länge: ♂ 4–4.5 mm., ♀ 5 mm.

Hab.: China (Tonkin); gesammelt in 5 (4 ♂, 1 ♀) Exemplaren von Herrn H. Fruhstorfer.

3. *Betacixius obliquus* sp. n.

Scheitel und Gesicht hellbräunlichgelb, das letztere in der Mitte am Rande weisslichgelb gefleckt, Clypeus an der Spitze, die äusserste Spitze ausgenommen, schwarz. Antennen, die gelbliche Spitze ausgenommen, dunkel. Rostrum gelblich, an der Spitze braun. Pronotum und Deckschuppen schmutziggelb, das erstere an den Seiten weisslichgelb, hinter dem Auge jederseits bräunlich gefleckt. Mesonotum schwarz, am der Spitze gelblich. Elytren hyalin, ein wenig gelblich getrübt, Nerven gelblich, Körnchen kaum dunkler, hellbräunlich behaart; in der Mitte des Clavus am Rande mit einem bräunlichen Querfleck; Stigma dunkel, von diesem bis zur Coriummitte zieht eine bräunliche Schrägsbinde; Basis auch etwas verbräunt. Unterseite bräunlich, Metasternum weisslichgelb, beim ♂ Genitalien hellbräunlichgelb. Beine blassgelblich, Coxen und Schenkel, die Spitzen ausgenommen, braun; Tibien mit bräunlichen Längsstreifen.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem zapfenförmigen Fortsatz, Griffel an der Basis zusammen einem breiten Kegel umschliessend, am Ende breit Pflugscharförmig erweitert.

♀ Bauchsegment 5 sehr breit rundlich ausgerandet, 6 am Hinterende gerade, Scheidenpolster etwas kürzer als die Legescheide, Afterröhre weisslich, Legescheide ein wenig aufwärts gebogen.

Länge: ♂ 5.2 mm., ♀ 5.6 mm.

Hab.: Honshu (Gifu und Asama); gesammelt in 3 (1 ♂, 2 ♀) Exemplaren von Herrn Y. Nawa und M. Oguma.

var. *pallens* n.

Ganz hellbräunlichgelb, Clypeus an der Spitze schwarz, Stigma, eine Schrägsbinde des Coriums sowie ein Querfleck des Clavus hellbräunlichgelb. Beine und Unterseite auch hellbräunlichgelb, Tibien mit einem bräunlichen Längsstreifen, Tarsen bräunlich, nur die Hintertarsen an den Spitzen bräunlich.

Hab.: Honshu (Tokyo, Harima), Kiushu (Kumamoto); gesammelt in 4 (2 ♂, 2 ♀) Exemplaren von Herren S. Iguchi und H. Kawamura und vom Verfasser.

4. *Betacixius kumejimae* sp. n.

♀ Hellbräunlichgelb. Scheitel und Pronotum blassgelblich, Gesicht in der Mitte am Rande jederseits mit einem weisslichen Flecke; Clypeus an der Spitze, die gelbliche äusserste Spitze ausgenommen braun; Rostrum gelblich, an der Spitze braun. Pronotum an den Seiten weisslich. Deckschuppen schmutziggelb, am Hinterrande verbräunt. Elytren hyalin, Nerven und Körnchen gelblich, bräunlich behaart, Bogenrand bräunlich, nahe der Basis und nahe der Mitte je mit einer bräunlichen Querbinde, Stigma dunkelbraun. Unterseite dunkelbraun, Metasternum blassgelblich, Beine hellbräunlichgelb, Schenkel in der Mitte etwas verbräunt, Tibien je mit einem bräunlichen Längsstreifen, Vorder- und Mitteltarsen bräunlich.

♀ Bauchsegment 5 breit rundlich ausgerandet, 6 schmutziggelb, am Hinterrande flach abgerundet, Scheidenpolster stark aufwärts gebogen, Legescheide auch aufwärts aber mässig gebogen.

Länge: ♀ 5.5 mm.

Hab.: Okinawa (Kumejima); 3 ♀ Exemplare gesammelt von Herrn K. Kuroiwa.

5. *Betacixius clypealis* sp. n.

Schwarz. Scheitel hellbräunlichgelb, Stirn bräunlich, an der

Spitze an den Seiten je mit einem weisslichen Flecke, beim ♂ Clypeus schwarz, an der äussersten Spitze gelblich, beim ♀ hellbräunlichgelb, an der Apicalhälfte des Clypeus schwarz. Rostrum gelblich, an der Spitze dunkelbraun. Antennen bräunlich, an der Spitze weisslich, die Umgebung der Antennen weisslich. Pronotum an den Seiten weisslich, Kiele gelblich. Mesonotum an der Spitze gelblich, ein Fleckchen in der Mitte des Schenkelrandes auch gelblich. Deckschuppen schmutziggelb, am Hinterrande dunkel. Elytren hyalin, kaum gelblich getrübt, Nerven und Körnchen gelblich, mit bräunlichen Härchen versehen; Stigma und Bogenrand dunkelbraun, ein Längsfleck in der Mitte des Clavus den Rand entlang dunkelbraun. Unterseite pechschwarz, Metasternum und Beine gelblich, Schenkel, die gelblichen beiden Enden ausgenommen, dunkel; Vorderbeine, die gelblichen Schenkelringen ausgenommen, dunkel; Mitteltibien mit einem bräunlichen Längsstreifen, die Tarsen bräunlich.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem gelblichen, dreieckigen Fortsatz, Griffel bräunlich, an der Basis zusammen einem Kurzkegel umschliessend, je am Ende breit pflug-scharförmig erweitert.

♀ Bauchsegment 5 breit ausgebuchtet, 6 gelblich, am Hinterrande gerade, Legescheide mässig aufwärts gebogen.

Läng: ♂ 5-5.5 mm., ♀ 6 mm.

Hab.: Formosa (Tappan); gesammelt in 9 (4 ♂, 5 ♀) Exemplaren vom Verfasser.

var. vittifrons n.

Vom Scheitel bis zur Mitte des Clypeus zieht ein breiter, schwärzlicher Längsstreif, welcher sich gegen die Spitze hin verbreitert.

Länge: ♂ 5 mm.

Hab.: Formosa (Tappan); 2 ♂ Exemplare gesammelt vom Verfasser.

6. *Betacixius brunneus* sp. n.

Der Form und Färbung nach *B. clypealis* m. sehr ähnlich, weicht aber wie folgt ab:

Oben gelblichbraun. Scheitel blassgelblich, Scheitelgrübchen deutlich tiefer und breiter. Stirn einfarbig hellbräunlichgelb; Stirn und Clypeus nicht so gewölbt wie bei *clypealis* m., an der Spitze verbräunt. Pronotum weisslich, die Seitenlappen braun, nur am Rande weisslich; Deckschuppen hellbräunlich; Mesonotum ganz gelblichbraun, nicht so gewölbt wie bei *clypealis* m.

♂ Die Seitenlappen des Genitalsegments je am Ende gelblich, die untere Ausbuchtung gelblich gerandet, Griffel an der Basis gelblich, je am Ende stumpfwinkelig nach aussen gebogen.

Länge: ♂ 6 mm.

Hab.: Formosa (Tappan, Toroen); 3 ♂ Exemplare gesammelt vom Verfasser.

7. *Betacixius rinkihonts* sp. n.

Hellbräunlichgelb. Antennen schwärzlich, oben gelblich, Ocellen rubinrot, ihre Umgebung ein wenig ausgedehnt dunkel. Clypeus nahe der Spitze und an den Seiten dunkel gefleckt. Rostrum an der Spitze verbräunt. Pronotum weisslichgelb. Mesonotum an den Seiten und Deckschuppen je am Hinterrande verbräunt. Elytren hyalin, kaum gelblich getrübt; Nerven gelblich und die Körnchen bräunlichgelb, spärlich behaart; Stigma in der Mitte mit einem bräunlichen, etwas gebogenen Striche; Costa und Bogenrand bräunlich; Clavus in der Mitte am Rande mit einem bräunlichen Fleckchen. Unterseite und Beine gelblich, Tibien je mit einem bräunlichen Längsstreifen, Vorder- und Mitteltarsen braun. Letztes Bauchsegment an den Seiten je mit einem dunklen Flecke.

♂ In der unteren Ausbuchtung des Genitalsegmentes mit einem dreieckigen weisslichen Fortsatz, Griffel an der Basis zusammen einen

spitzigen Kegel umschliessend, Griffel am Ende fast nierenförmig erweitert.

Länge: ♂ 5 mm.

Hab.: Formosa (Rinkihō); gesammelt in einem ♂ Exemplare vom Verfasser.

Gatt. *Oliarus* Stål.

Stål-Berl. ent. Zeit. VI, p. 306 (1862).

1. *Oliarus subnubilis* Uhl.

Cixius subnubilis Ohl. Proc. Nat. Mus. U. S. A. XIX, p. 279 (1896).

Hab.: Honshu (Gifu, Kiushu); gesammelt auf Citrus-Arten von Herrn Y. Nawa und vom Verfasser.

2. *Oliarus horishanus* sp. n.

Beim ♂ castanienbraun, beim ♀ rötlichgelb. Scheitel zweimal länger als der Abstand zwischen den Augen, die Seitenkiele gelblich. Stirn braun, Clypeus und Wangen gelblich, Mittel- und Seitenkiele rötlichgelb. Pronotum am Hinterrande und die Kiele gelblich. Mesonotum braun, mit rötlichen Kielen, beim ♀ ganz rötlichgelb. Elytren hyalin, ein wenig gelblich getrübt, an der Spitze ein wenig ausgedehnt verdunkelt; die Nerven dunkel, mit gelblichen Härchen; die Clavusnaht heller; Stigma dunkel, an der Innenseite blassgelblich. Flügel an der Spitze angeraucht. Beine und Rostrum gelblich, das letztere an der Spitze dunkel. Schenkel und Schienen gelblichbraun. Brust gelblich, Hinterleib dunkel, mit gelblichen Segmenträndern.

♂ Afterröhre etwa halbrundlich, Afterstielchen lang, Schaufelförmig; Griffel lang, linienförmig, in der Mitte nach innen schwach bogenförmig gekrümmt, am Ende abgerundet, in der unteren Ausbuchtung in der Mitte ein langer spitziger Fortsatz, die seitlichen Lappen des letzten Segments je an der Spitze rundlich ausgebuchtet.

♀ Bauchsegment 5 stumpfwinkelig und 6 rundlich ausgebuchtet, Segmentränder blassgelblich.

Länge: ♂ 10 mm., ♀ 10–11 mm.

Hab.: Formosa (Horisha, Gyochi, Rinkihō, Arisan, Hasshiran);

5 (4 ♂, 1 ♀) Exemplare in meiner Sammlung.

Der Form nach *G. subnubilis* Uhl. etwas ähnlich.

3. *Oliarus iguchii* sp. n.

Schwarz. Scheitel so lang wie der Abstand zwischen den Augen, vorn abgerundet, die Kiele gelblich, die hinteren Stirngrübchen fast oval. Gesicht im Profil mässig gebogen, der Mittelkiel gelblichbraun, die seitlichen Kiele gelblich. Pronotum am Hinterrande und die Kiele gelblich. Mesonotum an den Seiten und Deckschuppen je am Hinterrande gelblich. Elytren hyalin, hie und da dunkel gefleckt, Nerven gelblich, Körnchen bräunlich, nicht behaart, nahe der Mitte der Elytren mit einem dem Vorderrande nicht erreichenden, dunklen Querstricke; Stigma dunkel. Rostrum gelblich, das zweite Glied an der Spitze und das dritte ganz dunkel. Beine gelblich, Schenkel dunkelbraun, Tibien bräunlich.

♀ Bauchsegment 5 rundlich ausgebuchtet, 6 am Hinterrande fast gerade.

Länge: ♀ 8 mm.

Hab.: Honshu (Harima); 1 ♀ Exemplar gesammelt von Herrn S. Iguchi.

Der Form und Zeichnung nach *O. brevilinea* Mats. aus Ungarn (Fiume) sehr ähnlich.

4. *Oliarus quadricinctus* sp. n.

Schwarz. Scheitel fast so lang wie der Abstand zwischen den Augen, vorn abgerundet, Stirngrübchen verschmolzen, die Kiele gelblich. Gesicht in der Mitte an den Seiten gelblich. Rostrum gelblich,

das dritte Glied dunkel. Pronotum am Hinterrande und ihr Kiele gelblich. Mesonotum die Seiten entlang schmal gelblich; Deckschuppen schmutziggelb, an der Basis dunkel. Elytren hyalin, die Basis, 2 mittlere Querstreifen und die Spitze dunkel; Nerven gelblich, bräunlich fein gekörnelt, weisslich behaart, Quernerven bräunlich. Unterseite schwarz; Beine gelblich, Coxen und Schenkel (die Spitzen ausgenommen) dunkelbraun, Tibien bräunlich gestreift.

♂ Genitalien gelblich, Afterröhre lang oval, am Hinterrande jederseits mit einer spitzigen Vorragung. Griffel nahe der Basis stark nach aussen gebogen, an der Spitze etwas X-förmig erweitert, in der Mitte der unteren Ausbuchtung mit einem schmalen Fortsatze.

♀ Bauchsegment 5 schmal rundlich ausgebuchtet, 6 am Hinterrande etwas erweitert, an den Seiten blassgelblich.

Länge: ♂ 5.3 mm., ♀ 6 mm.

Hab.: Honshu (Maiko, Sendai, Amagi, Tokyo); gesammelt in zahlreichen Exemplaren vom Verfasser.

5. *Oliarus pachyceps* sp. n.

Gelblichbraun. Scheitel fast so lang wie der Abstand zwischen den Augen, vorn stumpfwinkelig, die hinteren Stirngrübchen zusammen verschmolzen, der Mittelkiel fehlend. Gesicht dunkel, in der Mitte an den Seiten und die Kiele gelblich, im Profil mässig gebogen. Pronotum schmutziggelb, an den Seiten dunkel gefleckt. Deckschuppen und das Mesonotum an der Spitze gelblich. Elytren subhyalin, gelblich getrübt, beim ♂ der Spitzendrittel dunkel getrübt, Nerven gelblich, fein bräunlich gekörnelt, Quervernen und beim ♀ die Gabel des zweiten und dritten Sektors sowie auch des Clavus je an der Basis dunkel. Unterseite bräunlich, Beine gelblich, Vorderschenkel bräunlich gestreift.

♂ Afterröhre oval; Griffel nahe der Spitze S-förmig gekrümmt und an der Spitze rundlich erweitert.

♀ Bauchsegment 5 breit rundlich ausgebuchtet, 6 am Hinterrande rundlich erweitert. Die Segmentränder blassgelblich.

Länge: ♂ 4,5–5 mm., ♀ 6 mm.

Hab.: Formosa (Koshun); gesammelt in 3 (2 ♂, 1 ♀) Exemplaren vom Verfasser.

Der Färbung und Form nach *O. tappanus* m. etwas ähnlich.

6. *O. apicalis* Uhl.

Mindus apicalis Uhl. Proc. Nat. Mus. U. S. A. XIX, p. 281 (1896).

Oliarus apicalis Mats. Ent. Nach. XX, p. 208 (1900).

Hab.: Honshu. Kiushu (häufig auf Gramineenpflanzen).

7. *Oliarus harimaensis* sp. n.

Hellbräunlichgelb. Scheitel bräunlich, $1\frac{1}{2}$ mal so lang wie der Abstand zwischen den Augen, die Kiele heller an der Spitze, der Querkiel spitzwinkelig. Stirn schwarz, die Kiele gelblich, beim ♂ Clypeus in der Mitte gelblich. Das dritte Glied des Rostrum an der äussersten Spitze dunkel. Pronotum blassgelblich, an den Seiten je mit einem dunklen Bogenfleck. Mesonotum ohne Zeichnung. Elytren hyalin, gelblich getrübt, die Nerven gelblich, spärlich gekörnelt, ohne Härchen, Quernerven und Körnchen auf dem Apicalfelde bräunlich. Unterseite bräunlich, Beine blassgelblich, Schenkel und Schienen undeutlich bräunlich gestreift.

♂ Afterröhre rundlich, Afterstielchen cylindrisch und kurz. Griffel schmal, an der Spitze S-förmig gekrümmt, an der Basis blattartig etwas verbreitert, in der Mitte der unteren Ausbuchtung mit einem langen, spitzigen Fortsatze.

♀ Bauchsegment 5 breit stumpfwinkelig ausgeschnitten, 6 am Hinterande breit rundlich etwas vorragend.

Länge: ♂ 6 mm., ♀ 6,5–7,2 mm.

Hab.: Honshu (Harima); zahlreiche Exemplare in meiner Sammlung.

Der Färbung nach *O. pallens* Germ. sehr ähnlich.

8. *Oliarus hachijonis* sp. n.

♀ Der Form und Färbung nach *O. harimaensis* m. sehr ähnlich, weicht aber wie folgt ab:

1. Scheitel etwas breiter und bräunlich gefärbt, die Kiele gelblichbraun. Scheitelgrübchen deutlich mehr oben gelegen als bei *harimaensis*.
2. Stirn zwischen den Augen deutlich breiter, Querkiel viel höher gelegen als bei *harimaensis*.
3. Mesonotum viel breiter.
4. Elytren hyalin, Stigma am Hinterrande bräunlich gerandet, Quernerven bräunlich, aber nicht so deutlich wie bei *harimaensis*, die Nerven ohne Härchen.
5. ♀ Letztes Bauchsegment am Hinterrande breit weisslich gerandet.

Länge: ♀ 7.5 mm.

Hab.: Hachijo Insel; ein ♀ Exemplar gesammelt von Herrn S. Takahashi.

9. *Oliarus ogasawarensis* sp. n.

Dunkelbraun, beim ♀ gelblichbraun. Scheitel gelblich, $1\frac{1}{2}$ mal so lang wie der Abstand zwischen den Augen, vorn stumpfwinkelig, Thälchen oft bräunlich, das vordere Stirngrübchen sehr klein, die hinteren oval, bräunlich ausgefüllt. Gesicht im Profil mässig gebogen, Kiele gelblich. Pronotum und Deckschuppen weisslich. Mesonotum an der Spitze gelblich, Kiele rötlichgelb. Elytren subhyalin, weisslich getrübt, Nerven blassgelblich, die Körnchen von gleicher Färbung, spärlich gelblich behaart, nicht deutlich, Quernerven bräunlich, Stigma blassgelblich, nicht gekörnelt. Rostrum und Beine blassgelblich, das erstere an der äussersten Spitze dunkel.

♂ Genitalien gelblich. Afterröhre halbrundlich; Griffel schmal, an der Basis breiter, an der Spitze S-förmig gekrümmt, in der Mitte der unteren Ausbuchtung mit einem spitzigen Fortsatze.

♀ Bauchsegment 5 bogig ausgebuchtet, 6 am Hinterrande etwas erweitert. Segmentränder blassgelblich.

Länge: ♂ 6 mm., ♀ 7 mm.

Hab.: Bonin Insel (Ogasawarajima); zahlreiche Exemplare gesammelt vom Verfasser.

Der Form und Färbung nach *O. pallens* Germ. etwas ähnlich.

10. *Oliarus boninensis* sp. n.

Schwarz. Scheitel 3 mal so lang wie der Abstand zwischen den Augen, Seitenkiele rötlichgelb. Stirn dunkel, Kiele rötlichgelb, Clypeus an der Basis gelblich. Pronotum am Hinterrande blassgelblich. Mesonotum schwarz, beim ♀ die Scheibe rötlich, mit rotbräunlichen Kielen, an der Spitze blassgelblich. Elytren hyalin, ein wenig gelblich getrübt, Nerven gelblich, mit gelblichen Härchen; Costa, Stigma und Quernerven dunkel. In der Mitte des Hinterrandes je mit einem dunklen Fleckchen. Beine blassgelblich, Schenkel mit undeutlichen, bräunlichen Längslinien, Brust und Bauch dunkelbraun.

♂ Afterröhre klein, oval, oben in der Mitte mit einem Längskiele; Griffel gelblich, an der Spitze nach aussen hakenförmig gekrümmt, die Spitze rundlich; in der unteren Ausbuchtung in der Mitte ein langer, schmaler, scharf zugespitzter, gelblicher Fortsatz.

♀ Bauchsegment 5 rundlich ausgebuchtet, 6 am Hinterrande schwach ausgerandet.

Länge: ♂ ♀ 5.5-6.5 mm.

Hab.: Bonin Insel (Ogasawarajima); 8 Exemplare gesammelt vom Verfasser.

11. *Oliarus tappanus* sp. n.

Dunkelbraun. Scheitel $1\frac{1}{2}$ mal so lang wie der Abstand zwischen den Augen, Kiele gelblich, vorn fast rechtwinkelig, 3 Stirngrübchen fast gleich lang. Gesicht im Profil ziemlich stark gebogen, Kiele bräunlichgelb, Rostrum gelblich, an der Spitze dunkel. Pronotum dunkel, Kiele und der Hinterrand weisslich. Mesonotum in der Mitte der Länge nach breit ausgehöhlt, Kiele bräunlichgelb. Elytren hyalin, kaum gelblich getrübt; Nerven gelblich, Quernerven bräunlich, stark bräunlich gekörnelt, spärlich behaart; Stigma dunkel und gekörnelt. Unterseite bräunlich; Beine bräunlichgelb, Vorder- und Mittelschenkel sowie auch Tibien bräunlich getrübt, die Tibien nahe der Basis und der Spitze sowie auch die Tarsen, die Basis ausgenommen, dunkelbraun, die Hinterschenkel vorwiegend bräunlich.

♂ Afterröhre oval, unten jederscits mit einem langen, zugespitzten Fortsatze. Griffel gerade, comprimirt, an der Spitze zugespitzt, die seitlichen Lappen des letzten Segmentes gelblich, je an der Spitze abgerundet und gelblich behaart.

♀ Bauchsegment 5 fast rechtwinkelig ausgebuchtet, 6 am Hinterrande in der Mitte rundlich erweitert.

Länge: ♂ 6—♀ 7 mm.

Hab.: Formosa (Tappan, Kuyania, Hoppo); gesammelt in 6 (1 ♂, 5 ♀) Exemplaren vom Verfasser.

12. *Oliarus speciosus* sp. n.

Castanienbraun. Scheitel 2 mal so lang wie der Abstand zwischen den Augen, vorn spitzwinkelig gekielt, die Stirngrübchen schmal dreieckig, die Kiele hellbräunlich. Gesicht gelblichbraun, in der Mitte an den Seiten gelblich, Clypeus an den Seiten dunkelbraun. Pronotum und Deckschuppen schmutziggelb; Mesonotum an den Seiten und die Kiele rötlich. Elytren subhyalin, weisslich getrübt; Nerven weisslich, mit zahlreichen, dunklen Körnchen, Quernerven und ihre Umgebung

dunkel; Stigma dunkel, an der Innenseite weisslich; Körnchen je mit einem dunklen Härchen. Unterseite, Rostrum und Beine rötlichgelb, Brust verbräunt, Rostrum an der Spitze bräunlich, Schenkel nach der Spitze verbräunt.

♂ Afterröhre oval. Griffel an der Basis schmal, an der Spitzenhälfte rundlich blattartig erweitert, in der Mitte der unteren Ausbuchtung mit einem spitzigen Fortsatze, die seitlichen Lappen lang, oben rechtwinkelig ausgeschnitten.

♀ Bauchsegment 5 fast rechtwinkelig ausgebuchtet, 6 hinten in der Mitte flach ausgerandet, Legescheide sehr lang.

Länge: ♂ 6 mm., ♀ 7 mm.

Hab.: Formosa (Koshun); gesammelt in 4 (1 ♂, 3 ♀) Exemplaren vom Verfasser.

13. *Oliarus velox* sp. n.

Der Form und Färbung nach *O. formosanus* m. sehr ähnlich, weicht aber wie folgt ab:

1. Scheitel schmaler und länger, bis zur Spitze fast parallel.
2. Gesicht ganz gelblich, die Stirnhälchen etwas bräunlich, im Profil fast gerade und nicht so stark gebogen wie bei *formosanus*; die Kiele höher, so dass die Stirnhälchen viel tiefer sind.
3. Körnchen der Elytren einfarbig mit den Nerven, nicht sehr deutlich; Costalfeld viel breiter als bei *formosanus*.
4. Unterseite und Beine gelblich, Brust an den Seiten etwas verbräunt.
5. ♂ Griffel länger, die gebogene Spitze breiter und in der Mitte nicht eingeschnürt wie bei *formosanus*.

Länge: ♂ 5.5—♀ 6.5 mm.

Hab.: Formosa (Koshun); gesammelt in 2 (1 ♂, 1 ♀) Exemplaren vom Verfasser.

14. *Oliarus oryzae* Mats.

Schäd. u. Nütz. Ins. von Zuckerrohr Formosas, p. 15,

Pl. XV, fig. 8, ♀ (1910).

♂ Der Färbung nach stimmt mit dem ♀ ganz über ein, nur der Apicaldrittel der Elytren verdunkelt.

♂ Afterröhre queroval; Griffel lang, gerade, einander fast anhangend, an der Spitze etwa rechtwinkelig gebogen; in der Mitte der unteren Ausbuchtung mit einem spitzigen Fortsatze.

Länge: ♂ 5 mm.

Hab.: Formosa (Chuhu, Taichu, Koshun); 4 Exemylare (2 ♂, 2 ♀) in meiner Sammlung.

15. *Oliarus mori* sp. n.

Schwarz. Scheitel mehr als 2 mal so lang wie der Abstand zwischen den Augen, vorn schmal spitzwinkelig, die hinteren Stirngrübchen sehr schmal, die seitlichen Kiele je nahe der Mitte mit 2 subhyalinen, weisslichen Fleckchen. Stirn im Profil fast gerade, Rostrum bräunlichgelb, an der Spitze dunkel. Pronotum dunkel, die Kiele schmutziggelb. Deckschuppen je am Hinterrande gelblichbraun. Elytren subhyalin, gelblich getrübt, besonders an der Basis tiefer gefärbt; Nerven gelblich, blassgelblich behaart, fein gekörnelt, gegen die Spitze hin werden die Körnchen bräunlich; Quernerven bräunlich; Stigma dunkel, am Vorderrande heller; Spitzenzellen meistens je mit einem undeutlichen, graulichen Fleckchen. Beine gelblich; Vorder- und Mittel-Coxen und die sämtlichen Schenkel dunkel.

♂ Genitalien gelblich, queroval, oben mit einem dunklen Striche; Griffel breit, kurz, comprimirt, an der Spitze mit einem nach aussen gekrümmten, schmalen Fortsatze; in der Mitte der unteren Ausbuchtung mit einem sehr schmalen, spitzigen Fortsatze.

♀ Bauchsegment 5 rundlich ausgebuchtet, 6 am Hinterrande flach ausgerandet.

Länge: ♂ 5.5 mm., ♀ 7 mm.

Hab.: Formosa (überall häufig); gesammelt auf Maulbeerbräumen vom Verfasser.

16. *Oliarus hopponis* sp. n.

O. mori m. sehr ähnlich, aber unterscheidet sich von dieser wie folgendes:

- ♂ 1. Scheitel deutlich schmaler, so dass der winkelige Querkel nach vorn schmaler und die seitlichen Kiele deutlich niedriger werden.
2. Gesicht in der Mitte etwas breiter, Clypeus gelblichbraun, Rostrum dunkel, nur an der Basis gelblich.
3. Mesonotum deutlich breiter.
4. Elytren feiner gekörnelt, nicht behaart, Stigma und Costalzelle viel breiter, die Nerven an der Spitze verbräunt, Apicalzellen ohne Fleckchen.
5. Beine gelblich, Schenkel etwas verbräunt.
6. ♀ Bauchsegment 6 am Hinterrande in der Mitte mit 2 kleinen, kaum sichtbaren Vorragungen; Segmentränder breit gelblich.

Länge: ♀ 6.5 mm.

Hab.: Formosa (Hoppono); nur ein ♂ Exemplare gesammelt vom Verfasser.

17. *Oliarus formosanus* sp. n.

Der Form nach *O. speciosus* m. sehr ähnlich, unterscheidet sich aber wie folgendes:

1. Scheitel an der Spitze deutlich schmaler spitzwinkelig, so dass die seitlichen Stirngrübchen noch schmaler dreieckig werden.
2. Clypeus und die Stirn an der Basis dunkel, Stirngipfel von den Seiten gesehen deutlich spitziger als bei *O. speciosus*.
3. Mesonotum in der Scheibe rötlich, an der Spitze gelblich.

4. Elytren deutlich feiner gekörnelt, die Härchen fast unsichtbar.
5. Unterseite dunkel.

♂ Afterröhre oval; Griffel gelblich, an der Basis breit, gegen die Spitze hin rechtwinkelig gebogen, und die gebogene Spitze in der Mitte eingeschnürt; in der Mitte der unteren Ausbuchtung mit einem kurzen, spitzigen Fortsatze,

♀ Bauchsegment 6 am Hinterrande fast gerade, Legescheide nur $\frac{1}{3}$ so lang wie bei *speciosus*.

Länge: ♂ 5 mm., ♀ 6 mm.

Hab.: Formosa (überall häufig); ein ♂ Exemplar gesammelt in Okinawa von Herrn T. Hira.

18. *Oliarus artemisiæ* sp. n.

Schwarz. Scheitel schmal, fast 3 mal so lang wie der Abstand zwischen den Augen, die seitlichen Kiele sehr hoch, vorn schmal spitzwinkelig, nahe der Mitte mit einem subhyalinen, weisslichen Fleckchen, der hintere Drittel auch weisslich. Gesicht lang, die Kiele gelblich, unterhalb der Mitte an der Seite gelblich gefleckt, das vordere Stirngrübchen spitzdreieckig, und nicht dunkel ausgefüllt. Wangen oberhalb der Antennen blassgelblich. Rostrum dunkel, an der Basis gelblich. Pronotum am Hinterrande und ihr Kiele gelblich. Mesonotum an den Seiten und an der Spitze gelblich; Deckschuppen am Hinterrande gelblich. Elytren hyalin; Nerven gelblich, an der Spitze verbräunt, bräunlich fein gekörnelt, nicht behaart; Quernerven dunkel; Costal- und Apicalzellen hie und da undeutlich dunkel gefleckt; Stigma breit, dunkel; die Gabel des Brachius und des Clavus verdunkelt. Beine dunkel; Tibien und Tarsen gelblich, die ersten dunkel gestreift.

♂ Genitalien gelblich, Afterröhre queroval, Griffel breit, gerade, an der Spitze nach aussen gebogen; in der Mitte der unteren Ausbuchtung mit einem schmalen spitzigen Fortsatze.

♀ Bauchsegment 5 breit rundlich ausgebuchtet, 6 am Hinter-
rande fast gerade; Segmentränder gelblich.

Länge: ♂ 6 mm., ♀ 8 mm.

Hab.: Hokkaido (Sapporo), Honshu; gesammelt in zahlreichen
Exemplaren auf einer *Artemisia*-Art vom Verfasser.

Der Form nach *O. angusticeps* Horv. sehr ähnlich, aber die
letzte viel kleiner.

19. *Oliarus angusticeps* Horv.

Oliarus angusticeps Horv. Term. Füzet. 15, p. 137 (1892).

Hab.: Japan.

Diese Art ist mir unbekannt.

20. *Oliarus kagoshimensis* sp. n.

Bräunlichgelb. Scheitel fast 3 mal so lang wie der Abstand
zwischen den Augen, vorn spitzwinkelig, die seitlichen Kiele hoch,
nahe der Mitte mit einem weisslichen Fleckchen, der hintere Drittel
sowie auch die Wangen vorwiegend weisslichgelb. Gesicht gelblich,
die Thälchen dunkelbraun, Clypeus an den Seiten und die Spitze des
Rostrum dunkel. Mesonotum beim ♂ an jeder Seite mit einem, und
der Vorderrand in der Mitte mit zwei dunkelbräunlichen Fleckchen.
Elytren subhyalin, gelblich getrübt; Nerven gelblich, Körnchen
gleichfarbig mit den Nerven, gegen die Spitze hin bräunlich werdend,
nicht behaart; Quernerven und Stigma braun. Apicalzellen hie und
da dunkel gefleckt. Hinterbrust weisslich; Beine gelblich, Schenkel
etwas verbräunt.

♂ Afterröhre rundlich. Griffel lang, gerade, dicht zusammen
schliessend, an der Spitze mit einem nach aussen rechtwinkelig
gebogenen, zugespitzten Fortsatze, in der Mitte der unteren Ausbuch-
tung mit einem kleinen Fortsatze.

♀ Bauchsegment 5 breit rundlich ausgebuchtet, 6 am Hinter-
rande in der Mitte flach ausgerandet.

Länge: ♂ 5.5—♀ 6.5 mm.

Hab.: Kiushu (Kagoshima, Futsukaichi); zahlreiche Exemplare gesammelt vom Verfasser.

Der Form nach *O. artemisiæ* m. sehr ähnlich, aber viel kleiner und ganz von bräunlichgelber Färbung.

Mundopa Dist.

Fauna British Ind. Rhyn. Vol. III., p. 263 (1906).

1. *Mundopa kotoshonis* sp. n.

Dunkelbraun. Die seitlichen Kiele des Scheitels, die Basalhälfte der Stirn, der Clypeus, das Rostrum, die Brust und Beine blassgelblich. Elytren dunkelbraun, die Mitte des ausgebuchteten Costalrandes weisslich, die Mitte des Coriums und das Spitzenfeld nur wenig ausgedehnt weisslich. Hinterflügel dunkel. Bauch dunkelbraun.

♂ Der Rand des Genitalsegments gelblich; in der Mitte der unteren Ausbuchtung mit einer kleinen Vorrangung; Griffel schmal und lang, in der Mitte je mit einer undeutlichen kleinen Vorrangung, an der Spitze nach aussen etwas hakenförmig gekrümmt.

Länge: ♂ 3.5 mm.

Hab.: Formosa (Kotosho Insel); 2 ♂ Exemplare gesammelt von Herrn T. Shiraki.

Der Form und Zeichnung nach. *M. cingalensis* Dist. sehr ähnlich, aber viel kleiner.

Barma Dist.

Faun. British Ind. Rhyn. Vol. III., p. 267 (1906).

1. *Barma maculata* sp. n.

Kopf, Pronotum Brust und Rostrum blassgelblich, Mesonotum hellbräunlichgelb. Elytren semiopak, weisslichgrau, mit 7 in etwa 3 Reihen (2, 3, 2) geordneten, dunklen Flecken; Apicalmembran

welche in der Mitte am Innenrande etwas unterbrochen ist, dunkel. Hinterflügel auch dunkel gefleckt. Beine schmutziggelb, Vorder- und Mittelschenkel verbräunt. Bauch bräunlich, Genitalsegment gelblich.

♂ Die seitlichen Lappen des Genitalsegments an der Spitze schmal abgerundet; ein spitziger Fortsatz in der Mitte der unteren Ausbuchtung; Griffel an der Basis schmal, gegen die Spitze hin allmählich breiter werdend, nahe dem Ende äusserlich mit einem etwa nach unten gekrümmten Fortsatze.

♀ Letztes Bauchsegment gelblich, am Hinterrande kaum ausgerandet; Legescheide bräunlich, lang, aufwärts gebogen.

Länge: ♂ 8 mm., ♀ 9 mm.

Hab.: Formosa (Toroen, Hoppo, Horisha); 9 (8 ♂, 1 ♀) Exemplare gesammelt auf einiger Pteridis-Arten.

Der Zeichnung nach *B. diversa* Dist. etwas ähnlich, aber viel grösser.

Brixia Stål.

Öfv. Vet-Ak. Förh. p. 162 (1856).

1. *Brixia marmorata* Uhl.

Cotyleceps marmorata Uhl. Proc. N. M. U. S. A. p. 280 (1896).

Hab.: Honshu, Shikoku, Kiushu; häufig auf *Salix*-Arten.

2. *Brixia harimaensis* sp. n.

Der Form und Zeichnung nach *B. marmorata* Uhl. sehr ähnlich, weicht aber in den folgenden Punkten wohl ab.

Scheitel lang, stark aufwärts gerichtet, die seitlichen, weisslichen Längs-Striche viel länger. Die Seitenkiele der Stirn ganz gelblich, nahe der Wurzel mit einer Reihe von bräunlichen Fleckchen; Gesicht viel schmaler. Mesonotum gelblichbraun, und an der Spitze nicht gelblich wie bei *marmorata*. Die Nerven der Elytren viel weniger

und undeutlicher gekörnelt, die Körnchen kaum dunkler als die Grundfarbe; Clavus schmutziggelb, in der Mitte am Rande mit einem kurzen dunklen Schrägsstriche, die Innenseite der Schrägsnerven weisslich; in der Mitte der Naht äusserlich im Corium mit einem bogenförmigen, weisslichen Flecke, welcher dunkel gesäumt ist; nahe der Mitte des Coriums von der Naht bis zum Brachius zieht eine etwas nach aussen gebogene, bräunliche Binde, welche äusserlich weisslich gerandet ist; Stigma braun, weisslich gerandet; Spitzenfeld dunkel, nahe der Costa mit einem gelblichen Flecke; im Costalfelde mit 3 bräunlichen Flecken, Bogenrand braun, innerhalb desselben mit einem bräunlichen, dreieckigen Fleckchen. Beim ♀ Vorder- und Mittelschenkel verbräunt.

♀ Griffel stiefel-förmig gekrümmt, an der Spitze dunkel und nach innen wieder stark gekrümmt.

♀ Bauchsegment 6 am Hinterrande in der Mitte mit einer undeutlichen, niedrigen Vorrangung.

Länge: ♂ 7 mm., ♀ 9 mm.

Hab.: Honshu (Akashi, Yamato), Kiushu (Jono); 3 (2 ♂, 1 ♀)

Exemplare gesammelt von Herrn T. Isshiki und vom Verfasser.

3. *Brixia formosana* sp. n.

Der Form und Zeichnung nach *B. marmorata* Uhl. sehr ähnlich, unterscheidet sich aber wie folgt:

Scheitel mit 2 schwarzen Längsstrichen, ohne weisslichen Strich. Gesicht gelblich, die seitlichen Kiele entlang mit einer Reihe von bräunlichen Fleckchen, Clypeusnaht bräunlich. Elytren nahe der Mitte mit zwei bräunlichen Flecken, von welchen der eins an der Naht liegt und von dreieckiger Form ist, innerhalb der Clavusspitze mit einem bräunlichen Flecke, in der Mitte vor dem Stigma mit einem nur die Mitte des Coriums erreichenden, bräunlichen Querstreifen; Stigma gelblich, aber kleiner, Spitzenrand schwach angeraucht,

ohne Fleckchen, die Region der Apicalnerven unregelmässig bräunlich gefleckt; ein von der Costalbasis bis zur Clavusmitte ziehender, bräunlicher Schrägsstreif sehr deutlich.

♀ Bauchsegment 6 am Hinterrande kaum vorragend.

Länge: ♀ 7.5 mm.

Hab.: Formosa (Kanshirei); gesammelt in einem ♀ Exemplare vom Verfasser.

4. *Brixia ocellata* sp. n.

Der Form und Färbung nach *B. marmorata* Uhl. ähnlich. Scheitel hellbräunlich, ohne Fleckchen. Gesicht sehr schmal, die seitlichen Kiele subhyalin, gelblich, ohne Fleckchen. Mesonotum in der Mitte braun, an den Seiten gelblich. Elytren gelblich, von der Basis bis zur Mitte des Clavusrandes zieht eine weissliche Schrägsbinde, nahe der Spitze des Clavus mit einem bräunlich gerandeten, weisslichen Fleckchen, nahe der Basis am Costalrande mit einem grossen, dreieckigen, dunkel gerandeten, subhyalinen Flecke, in der Mitte auch ein kleiner subhyaliner Fleck; innerhalb der Clavusspitze mit einem schwarzen Ringsfleck, welcher mit einer weisslichen Pupille versehen ist und von welchem bis zum Brachius eine weissliche, inwendig dunkel gerandete, weissliche Querbinde verläuft; von der Clavus-Spitze bis zum Brachius zieht auch eine inwendig dunkel gerandete, weissliche Querbinde, die Region der Apicalquernerven mit einer bräunlichen Querbinde, an der Spitze am Vorderrande mit einem kurzen, bräunlichen Schrägsstriche. Unterseite und Beine blassgelblich.

♀ Bauchsegment 6 am Hinterrande flach ausgerandet.

Länge: ♀ 6.5 mm.

Hab.: Formosa (Koshun); 1 ♀ Exemplar gesammelt vom Verfasser.

Der Zeichnung nach auch *Melandeva ocellata* Dist. ähnlich.

Kirbyana Dist.

Fauna Brit. Ind. Rhyn. p. 262 (1906).

1. *Kirbyana pagana* Melich.

Kirbya pagana Melich. Homp.-Faun. Ceyl. p. 38 (1903); Mats.—

Schüd. u. Nütz. Ins. Zuckerrohr Formosas, p. 14 (1910).

Hab.: Formosa (Kanshirei). Sonstige Fundort: China, Malay,
Indien.

On Four Polycystid Gregarines from the Intestine of *Tribolium ferrugineum* F.

By

S. Ishii, *Rigakushi.*

With 4 Figures.

In the intestine of the beetle, *Tribolium ferrugineum* F., I have found four polycystid gregarines, of which one is referable to the already known species *Gregarina cuneata* F. STEIN, while the remaining three are forms apparently not yet described. The host beetles were collected in the Province of Izu in the early part of October last year.

1. *Gregarina cuneata* F. STEIN. (Fig. 1).

1848, F. STEIN, *Gregarina cuneata*: Arch. Anat. Physiol. Med.

1875, AIMÉ SCHNEIDER, *Clepsidrina polymorpha* var. *Clepsidrina cuneata* (STEIN): Arch. Zool. Exp., tom. 4.

1899, A. LABBÉ, *Gregarina polymorpha cuneata* F. STEIN: Sporozoa.

1902, BERNDT, *Gregarina cuneata*: Arch. f. Protistenk., Bd. 1.

1904, LÉGER et DUBOSCQ, *Gregarina cuneata* F. ST.: Arch. f. Protistenk., Bd. 4.



Fig. 1. *Gregarina cuneata* in syzygy. 360x.

The larger sporonts are usually associated in syzygy ; the smaller ones solitary. The infection is generally not heavy, but pretty common.

2. *Gregarina minuta* sp. nov. (Fig. 2).

The larger sporonts are usually in association, the smaller ones often solitary.

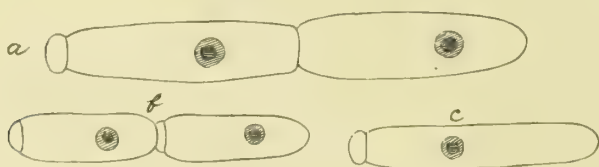


Fig. 2. *Gregarina minuta* n. sp.

a, A large syzygy with satellite lacking protomerite. *b*, A small syzygy.
c, A solitary sporont. All 360 \times .

Protomerite ovoid, sometimes more or less half-moon-shaped, broader than long. It is not large, especially so in the satellite, in which it is not infrequently hidden from view, being entirely imbedded in the deutomerite of the primate.

Deutomerite elongate, cylindrical, rounded posteriorly. Between the two segments of the body there is usually a distinct constriction.

Epicyte thin, rigid. Sarcocyte thin all over the body. Septal region not thick. Endocyte not dense, almost clear in appearance.

Nucleus large, spherical, usually situated near the middle of deutomerite, clearly visible in living animals in both primate and satellite. Karyosome single, large, spherical.

Cyst small, spherical.

Measurements :

Larger association :

Primite	{	Length of protomerite,	8 μ .
		Breadth of protomerite,	14 μ .
		Length of deutomerite,	92 μ .
		Breadth of deutomerite,	24 μ .
		Total length,	100 μ .
Satellite	{	Length of deutomerite,	88 μ .
		Breadth of deutomerite,	26 μ .
		Protomerite absent.	
Total length of the association,			188 μ .

Smaller association :

Primite	{	Length of protomerite,	6 μ .
		Breadth of protomerite,	11 μ .
		Length of deutomerite,	52 μ .
		Breadth of deutomerite,	19 μ .
		Total length,	58 μ .
Satellite	{	Length of protomerite,	4 μ .
		Breadth of protomerite,	8 μ .
		Length of deutomerite,	56 μ .
		Breadth of deutomerite,	20 μ .
		Total length,	60 μ .
Total length of the association,			118 μ .

Solitary sporonts :

Length of protomerite,	5-8 μ .
Length of deutomerite,	22-112 μ .
Breadth of body,	6-28 μ .
Total length of body,	27-120 μ .
Diameter of cysts,	36-48 μ .

Many sporonts, sometimes in association, were found dead in the faeces of the host. They were usually unchanged in form, but sometimes greatly emaciated and wrinkled.

Infection usually not heavy, nor common.

This form greatly resembles *Gregarina polymorpha* (HAMMER-SCHMIDT), but differs from it in being generally smaller, in the frequent absence of protomerite in the satellite, and in the spherical shape of cysts. In *G. polymorpha*, so far as I know, the protomerite is always present and the cyst is of an oval shape.

3. *Gregarina crassa* sp. nov. (Fig. 3).



Fig. 3. *Gregarina crassa* n. sp. 360x.

Sporonts usually in association.

Protomerite ovoid, relatively very small, always broader than long, usually not visible in satellite.

Deutomerite also ovoid, very large, rounded posteriorly. Satellite with posterior part of deutomerite usually somewhat narrowed. Between the two segments of body there exists a distinct constriction.

Epicyte thin, especially so in protomerite. Sarcocyte very thin all over, being not much thicker than epicyte. Septal region not thick, inconspicuous. Endocyte almost clear in protomerite, with only a few number of granules; but very dense in deutomerite, giving it a dark brownish black colour.

Nucleus usually situated near the middle of deutomerite. It is only vaguely visible owing to the great denseness of the endocyte.

Measurements :

Average association :

Primitæ	{	Length of protomerite,	6 μ .
		Breadth of protomerite,	16 μ .
		Length of deutomerite,	112 μ .
		Breadth of deutomerite,	64 μ .
		Total length,	118 μ .
Satellite	{	Length of deutomerite,	124 μ .
		Breadth of deutomerite,	60 μ .
		Protomerite absent.	
Total length of the association,			242 μ .

Solitary sporonts :

	A	B
Length of protomerite,	6 μ .	8 μ .
Length of deutomerite,	112 μ .	92 μ .
Breadth of body,	60 μ .	52 μ .
Total length of body,	118 μ .	100 μ .

In one case I have found a free sporont which was apparently without protomerite. It was slightly narrower at one end of the body. Probably I had only a detached satellite before me.

Infection not heavy, nor common.

This form resembles in some points *Gregarina Steini* which was described by BERNDT¹⁾ from the intestine of *Tenebrio molitor*, but differs from this in the much smaller protomerite, in the thicker deutomerite, and in the frequent absence of protomerite in the satellite.

4. *Steinina obconica* sp. nov. (Fig. 4).

In trophic stages always solitary.

Epimerite not deciduous, somewhat conical in shape, small and short, having an average length of only 6 μ . On several occasions

1) BERNDT, A.—“Beitrag zur Kenntniss der im Darne der Larve von *Tenebrio molitor* lebenden Gregarinen.” Arch. f. Protistenk., Bd. I., 1902.

I have observed the animal attached to the epithelium of host intestine by the small epimerite.¹⁾



Fig. 4.

Steinina obconica n. sp.
A cephalont. 360x.

Protomerite half-moon-shaped, more or less compressed antero-posteriorly, always broader than long.

Deutomerite rather obconical, broadest close to the septum, narrowing posteriorly and ending with obtuse end; usually 3 or 4 times as long as the protomerite. The constriction between the two segments of body is in most cases not conspicuous, often nearly so obsolete as to obscure the distinction between protomerite and deutomerite.

Epicyte thin, especially so in protomerite. Sarcocyte thin near the septum, but thicker towards the posterior end of deutomerite; thick-end also along the anterior end of protomerite. Septum very thin, inconspicuous. Endocyte very

dense and dark in both segments, lighter towards the posterior end of deutomerite evidently owing to the thinning of body.

Nucleus can not be clearly seen in living specimens, it being deeply imbedded among endocytic granules. It is situated usually in the broadest portion of deutomerite. In many cases the body is bent toward one side, giving rise to a shape remotely resembling that of a comma.

Cyst large, spherical or somewhat ovoid.

Measurements :

	A	B	C	D	E
Length of protomerite,	28 μ ,	28 μ ,	32 μ ,	24 μ ,	20 μ .
Length of deutomerite,	112 μ ,	112 μ ,	116 μ ,	80 μ ,	100 μ .

1) The so called "bouton aplati" of LÉGER et DUBOSCQ ("Nouvelles recherches sur les grégaires et l'épithélium intestinal des Trachéates," Arch. f. Protistenk., Bd. 4., 1904.) is likely something different from true epimerite.

Breadth of body, 68 μ , 80 μ , 80 μ , 52 μ , 56 μ .

Total length of body

(excepting epimerite), 140 μ , 140 μ , 148 μ , 104 μ , 120 μ .

Diameters of an average-sized cyst, 120 $\mu \times$ 108 μ .

Infection not heavy, but pretty common.

This gregarine differs from *Steinina ovalis* (F. STEIN) in the peculiar shape of deutomerite, *i. e.*, in this being obconical instead of oval.¹⁾ Further, the two species differ in the shape of protomerite.

Tokyo, Nov. 7, 1913.

1) Cf. LÉGER et DUBOSCQ, *op. cit.*

Notizen über japanische Ascidien, II.*

Von

Dr. Asajiro Oka.

Tokio.

Mit 16 Figuren.

Fam. MOLGULIDÆ.

Obgleich es nicht zu leugnen ist, dass diese Familie gegenüber den andern stolidobranchiaten Familien, den Cynthiiden und Styeliden, in der japanischen Meeresfauna stark zurücktritt—wir kennen ja zur Zeit nur eine einzige Art, *Molgula japonica* Hartmeyer, aus Japan—, so ist sie doch tatsächlich nicht so artenarm in unsern Gewässern, wie es nach den vorliegenden Daten den Anschein hat. Unter meinem Material von einheimischen Ascidien, das keineswegs als erschöpfend bezeichnet werden darf, finden sich nicht weniger als acht Arten, die ich hier kurz beschreibe. Zwei davon gehören zu bereits bekannten Formen, die übrigen erwiesen sich als neu für die Wissenschaft. Sie gehören alle zu der Gattung *Molgula*.

Nach der Zahl der Längsfalten am Kiemensack lassen sich die Arten wie folgt einteilen:

Kiemensack mit 5 Falten jederseits,

1. *Molgula crystallina* Möller.

2. *Molgula redikorzevi* n. sp.

Kiemensack mit 6 Falten jederseits,

3. *Molgula rotunda* n. sp.

* A. Oka, Notizen über japanische Ascidien, I. Annot. zool. japon. Vol. VI. 1906.

Kiemensack mit 7 Falten jederseits,

4. *Molgula japonica* Hartmeyer.
5. *Molgula vannamei* n. sp.
6. *Molgula aidae* n. sp.
7. *Molgula hartmeyeri* n. sp.
8. *Molgula xenophora* n. sp.

1. *Molgula crystallina* Möller.

Clavelina crystallina. Möller, H. P. C., Index molluscorum Grönlandiae. Naturh. Tidsskr. Vol. IV. 1842.

Molgula crystallina. Danielsen, D. C., Beretning om en zoologisk Reise foretagen i Sommeren 1857. Nyt Mag. Naturvidensk. Vol. XI. 1861.

Pera crystallina. Verrill, A. E., Recent Additions to the Molluscan Fauna of New England. Amer. Journ. Sci. Ser. 3. Vol. III. 1872.

Caesira crystallina Hartmeyer, R., Tunicata. Bronn's Kl. u. Ordn. d. Tierreichs. III. Bd. Suppl. I. Abt. 1909.



Fig. 1.

Molgula crystallina. Von links. $\times 3$.



Fig. 2.

Molgula crystallina. Von rechts. $\times 3$.

Äussere Kennzeichen. Körper birnförmig oder kurz gestielt eiförmig, festsitzend; Länge (einschliesslich des Stiels) 12–18 mm., Dicke 8–10 mm. Stiel von wechselnder Länge, entweder vom eigentlichen Körper deutlich abgesetzt oder in ihn übergehend, immer an der Ventralseite.

Siphonen sehr kurz; die Öffnungen ganz oder wenig erhaben,

ungefähr $\frac{1}{4}$ des medianen Körperrumfanges von einander entfernt; Ingestionsöffnung median, an der Vorderfläche, 6-lappig; Egestionsoffnung dem Stielansatz bezw. dem zugespitzten Körperende entgegengesetzt, 4-lappig.

Oberfläche eben und völlig glatt, frei von Fremdkörpern und Einlagerungen.

Farbe des konservierten Tieres blasgelblich, durchscheinend.

Testa: weich knorpelig, durchsichtig, von geringer Dicke.

Tunica: dünn, durchsichtig; Muskulatur an den Siphonen ziemlich gut entwickelt, an sonstigen Körperteilen äusserst schwach.

Tentakel: zusammengesetzt, baumartig verästelt, über 100 an Zahl, von verschiedener Grösse, regelmässig angeordnet. Die kleinsten Tentakel sind unverzweigt, fingerförmig.

Kiemensack: mit 5 Längsfalten jederseits; jede Falte mit 3-4 inneren Längsgefässen. Intermediäre Längsgefässe fehlen. Felder zwischen den Falten rechteckig; Infundibula flach, gewöhnlich ein einziges, manchmal auch 2 in jedem Felde. Kiemenspalten länglich, schmal, halbmondförmig gebogen.

Flimmerorgan: hufeisenförmig, etwas länger als breit; die beiden Hörner einwärts gebogen; die Öffnung nach rechts gewandt.

Dorsalfalte: ziemlich hoch, glattrandig, nicht gerippt.

Darm: linksseitig, der inneren Fläche der Tunica angeheftet, eine längliche schmale Schlinge bildend. Magen oval, mit Leberlappen; Anus mit glattem Rande, am Kiemensack angewachsen.

Exkretionsorgan: rechtsseitig, eine wurstförmige, kaum gebogene Nierenblase.

Geschlechtsorgane: beiderseits eine langgestreckte zwittrige Gonade; die linke oberhalb der Darmschlinge, die rechte oberhalb der Nierenblase, parallel derselben.

Fundnotiz. Kurillen, bei Urup Insel, 227 Faden (Coll. "Albatross"); 1 Exemplar. Kamtschatka, 57 Faden (Coll. "Albatross"); 1 Exemplar.

Anmerkung. Von dieser Art liegen mir 2 Exemplare vor, die beide von dem amerikanischen Dampfer "Albatross" erbeutet wurden. Das eine besitzt einen kegelförmigen, vom Rumpf deutlich abgesetzten Stiel, das andere dagegen ist an der Ventralseite einfach zugespitzt. Beide stimmen mit den Beschreibungen früherer Autoren durchaus überein und geben keine Veranlassung zu weiteren Bemerkungen. Nur die Fundorte liegen bedeutend weiter nach Süden als der bekannte südlichste. Interessant ist auch die Tatsache, dass das Tier, welches in seiner Heimat im arktischen Gebiet nur in geringer Tiefe vorkommt, an dem südlicheren der beiden Fundorte aus einer bedeutend grösseren Tiefe erbeutet wurde.

2. *Molgula redikorzevi* n. sp.

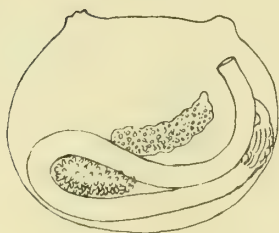


Fig. 3.

Molgula redikorzevi. Von links. $\times 1.5$.



Fig. 4.

Molgula redikorzevi. Von rechts. $\times 1.5$.

Äussere Kennzeichen. Körper länglich oval oder birnförmig, mit dem verjüngten Körperende festsitzend; Länge 36 mm, Breite 24 mm, Querschnitt rundlich oval.

Siphonen sehr kurz; Körperöffnungen flach, kaum erhaben, etwa $\frac{1}{4}$ des medianen Körperumfanges von einander entfernt; Ingestionsoffnung median, nahe dem Mittelpunkt der Vorderfläche, 6-lappig; Egestionsoffnung dem freien breiteren Körperende genähert, 4-lappig.

Oberfläche nacht, eben, ziemlich glatt, nur hier und da schwach gerunzelt, vollkommen frei von Fremdkörpern.

Farbe beim konservierten Tier blasgelblich, durchscheinend; die inneren Organen schimmern undeutlich durch die Körperhaut hindurch.

Testa: dünn, knorpelig, durchsichtig.

Tunica: dünn, durchsichtig; Muskulatur, abgesehen von den Siphonemuskeln, nur sehr schwach entwickelt.

Tentakel: zusammengesetzt, baumartig verästelt, von verschiedener Grösse, über 40 an Zahl; grosse und mittlegrosse ziemlich regelmässig alternierend, dazwischen noch viel kleinere; die kleinsten nur spärlich verästelt.

Kiemensack: mit 5 Falten jederseits; 2–3 innere Längsgefässe auf jeder Falte. Intermediäre Längsgefässe fehlen. Quergefässe nicht deutlich. Infundibula gross, flach, in regelmässigen Längs- und Querreihen angeordnet; meist 1 Infundibulum, stellenweise 2 in einem Felde. Kiemenspalten meist lang und halbmondförmig gebogen.

Flimmerorgan: hufeisenförmig, die beiden Hörner einwärts gebogen, aber nicht eingerollt; Öffnung nach hinten gewandt.

Dorsalfalte: schmal, glatt, glattrandig.

Darm: linksseitig, eine längliche, ziemlich enge Schlinge bildend. Magen mit wohlentwickelten Leberlappen; Anus glattrandig; der ganze Enddarm bis an den After dem dorsalen Rande des Kiemensacks dicht anliegend.

Exkretionsorgan: eine grosse, kaum gebogene, wurstförmige Nierenblase an der rechten Seite.

Geschlechtsorgane: beiderseits ein Ovarium und ein Hoden; das linke Ovarium oberhalb der Darmschlinge, das rechte oberhalb der Niere; der linke Hoden in der Darmschlinge, der rechte unterhalb der Nierenblase, dieselbe teilweise von innen bedeckend.

Fundnotiz: Kamtschatka, 40 und 43 Faden (Coll. "Albatross"); 2 Exemplare.

Anmerkung. Diese Art, die ich dem russischen Ascidiologen Dr. W. Redikorzev widme, gehört eigentlich noch nicht in die japanische Fauna. Ich habe sie trotzdem in diese Notizen aufgenommen, da es

höchst wahrscheinlich ist, dass sie, ähnlich wie die vorige Art, sich bis zu den Kurillen verbreitet.

Durch die eigentümliche Lage der getrennten Gonaden erinnert diese Art zunächst an *Molgula retortiformis* Verrill, aber diese letztere besitzt 7 Falten jederseits am Kiemensack und auffallend lange Siphonen. Auch liegt der linke Hoden nicht nur in der Darmschlinge, sondern erstreckt sich auch unterhalb derselben. Bei *M. siphonalis* Sars, die ebenfalls getrennte Gonaden besitzt, ist die Lage des linken Hodens wieder eine andre, indem er gänzlich unterhalb der eng geschlossenen Darmschlinge gelagert ist. Am nächsten scheint mir die neue Art noch der *Molgula crystallina* zu stehen, mit der sie ausser der Zahl der Kiemenfalten noch eine Reihe äusserer Charaktere gemein hat.

3. *Molgula rotunda* n. sp.

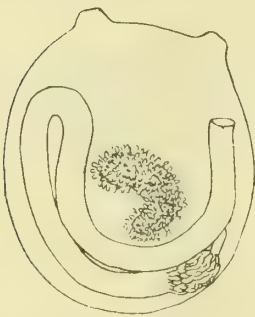


Fig. 5.
Molgula rotunda. Von links. $\times 3$.



Fig. 6.
Molgula rotunda. Von rechts. $\times 3$.

Äussere Kennzeichen. Körper rundlich oval, wenig höher als breit, mit der hinteren Partie und mit der rechten Seite an Hydroidpolypen festgewachsen; Höhe 14 mm, Breite 12.5 mm, Querschnitt oval.

Siphonen ganz kurz; die Körperöffnungen etwa $\frac{1}{6}$ des medianen Körperumfanges von einander entfernt, beide an der Voredrfläche; Ingestionsöffnung 6-lappig, Egestionsoffnung 4-lappig.

Oberfläche im allgemeinen eben, keine merkliche Runzeln, überall mit ganz feinen Sandkörnchen spärlich bedeckt.

Farbe des konservierten Tieres blassgelblich, halb durchscheinend.

Testa: dünn, knorpelig, durchsichtig; Haftfaden überall vorhanden, aber sehr kurz, beinahe warzenförmig.

Tunica: dünn, durchsichtig; Muskulatur am Körper nur schwach entwickelt.

Tentakel: zusammengesetzt, baumartig, aber nicht besonders reichlich verästelt; ca. 11 an der Zahl, grössere und kleinere nicht ganz regelmässig alternierend.

Kiemensack: mit 6 Falten jederseits; 4-5 innere Längsgefässe auf jeder Falte; intermediäre Längsgefässe fehlen. Quergefässe nicht gut entwickelt. Kiemenspalten gebogen, teilweise in Spiralen angeordnet; Infundibula zahlreich, aber klein.

Flimmerorgan: breit hufeisenförmig, die beidn Hörner nicht eingerollt; Öffnung nach hinten und etwas nach links gewandt.

Dorsalfalte: schmal, glattrandig, nicht gerippt.

Darm: linksseitig eine sehr lange, fast geschlossene, bogenförmig gekrümmte Schlinge bildend, deren Umbiegungsstelle weit nach vorn bis in die Nähe des Ingestionssiphos hinreicht. Magen klein, mit deutlichen Leberlappen; After glattrandig, am Kiemensack angewachsen.

Exkretionsorgan: rechtsseitig eine grosse wurstförmige, schräg gestellte Nierenblase.

Geschlechtsorgane: beiderseits eine zwitterige Gonade; die linke, V-förmig geknickt, oberhalb der Darmschlinge, d. h. in dem durch die Darmschlinge halbkreisförmig umgeschlossenen Raum; die rechte, lang gestreckt, oberhalb der Nierenblase, parallel derselben.

Fundnotiz. Kamtschatka, 72 Faden (Coll. "Albatross"); 1 Exemplar.

Anmerkung. Diese Art, die mir nur in einem einzigen, vom "Albatross" gesammelten Exemplar vorliegt, scheint der *M. ampul-*

loides Bened. am nächsten zu stehen. Sowohl im äusseren Habitus wie auch in der eigentümlich gekrümmten Darmschlinge stimmen die beiden Arten vollkommen überein, aber die neue Art hat einen glattrandigen After statt eines gezähnelten. Auch die Zahl der Längsgefässe auf den Kiemenfalten ist, wenn auch unbedeutend, bei beiden Arten verschieden.

4. *Molgula japonica* Hartmeyer.

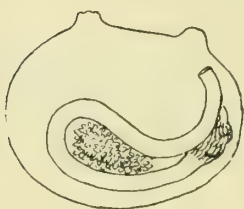


Fig. 7.

Molgula japonica. Von links. $\times 1$.

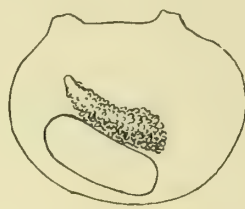


Fig. 8.

Molgula japonica. Von rechts. $\times 1$.

Molgula japonica. Hartmeyer, R., Ein Beitrag zur Kenntniss der japanischen Ascidienfauna. Zool. Anz. Bd. XXXI. 1906.

Äussere Kennzeichen. Körper länglich oval, frei; Länge 34 mm, Breite 21 mm, Querschnitt fast kreisrund.

Siphonen sehr kurz; die Öffnung äusserlich nicht erkennbar, etwa $\frac{1}{6}$ des medianen Körperumfangs von einander entfernt, beide median an der Vorderfläche; Ingestionsöffnung 6-lappig, Egestionsöffnung 4-lappig.

Oberfläche vollständig mit einer dichten Lage von Sandkörnchen und kleinen Steinen bedeckt. Farbe der Sandkörnchen bei dem vorliegenden Stücke dunkelgrau.

Testa: nicht besonders dick, aber ziemlich fest, weisslich.

Tunica: Siphonemuskeln wohl entwickelt; daneben noch ein System von eigentümlichen kurzen Muskeln, die im vorderen Körperabschnitt die derberen Längsmuskelbänder senkrecht schneiden und in

mehreren bandartigen Reihen parallel zur Körperlängsachse angeordnet sind.

Tentakel: reichlich verästelt, ca. 16, grössere und kleinere ziemlich regelmässig alternierend.

Kiemensack: jederseits mit 7 Falten; 11–12 innere Längsgefässe auf jeder Falte, 1 inneres Längsgefäss in jedem Faltenzwischenraum; Quergefässe 1. und 2. Ordnung, die alternieren. In grossen Feldern zwischen 2 Quergefässen 1. Ordnung zwei nicht besonders tiefe Infundibula, die sich wiederum gabeln. Kiemenspalten ziemlich lang, fast gerade oder nur schwach gebogen.

Flimmerorgan: länglich hufeisenförmig mit spiralig eingerollten Schenkeln; Öffnung nach hinten gewandt.

Darm: linksseitig eine lange, ziemlich weite Schlinge bildend; Magen mit deutlichen Leberlappen; After glattrandig.

Exkretionsorgan: eine grosse, lange, wurstförmige Nierenblase an der rechten Seite.

Geschlechtsorgane: jederseits eine längliche, keulenförmige hermaphroditische Gonade; die linke in der Darmschlinge, die rechte oberhalb der Nierenblase.

Fundnotiz. Tateyama, 10 Faden; 1 Exemplar.

Anmerkung. Das einzige Exemplar stimmt in allen wesentlichen anatomischen Merkmalen mit der Beschreibung von Hartmeyer so genau überein, dass ich nicht anstehe, dasselbe dieser Art zuzurechnen. Wie unten erwähnt wird, findet sich unter japanischen Molguliden eine Art, die in der Lage der linken Gonade innerhalb der Darmschlinge, zwei andre, die in der eigentümlichen Beschaffenheit der Muskulatur mit dieser Art übereinstimmen, alle drei sind aber in anderweitigen Charakteren von dieser Art ganz verschieden. Merkwürdig ist, dass in der Bucht von Tateyama, wo ich seit siebzehn Jahren Ascidien sammle, diese Art bisher nur einmal und in einem einzigen Exemplar gefunden worden ist.

5. *Molgula vannamei* n. sp.

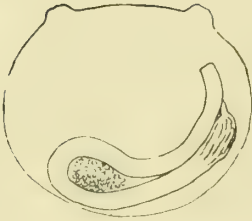


Fig. 9.

Molgula vannamei. Von links. $\times 2.5$.



Fig. 10.

Molgula vannamei. Von rechts. $\times 2.5$.

Äussere Kennzeichen. Körper rundlich oval, seitlich wenig zusammengedrückt, mit einem kleinen Bezirke der hinteren Partie festgewachsen (?); Länge 16 mm, Breite 12 mm.

Siphonen sehr kurz, die Körperöffnungen ungefähr $\frac{1}{3}$ des medianen Körperumfanges von einander entfernt, beide an der Vorderfläche; Ingestionsöffnung undeutlich 6-lappig, Egestionsöffnung 4-lappig.

Oberfläche im allgemeinen eben, nackt; Haftfaden, an denen stellenweise feine Schlammpartikeln anhaften, kurz, gleichmässig zerstreut.

Farbe des konservierten Tieres hellbräunlich, durchscheinend.

Testa: sehr weich, nicht besonders dünn, gallertig aber zäh, durchsichtig; lässt sich nicht leicht vom unterliegenden Gewebe abheben.

Tunica: dünn, durchsichtig; Muskulatur schwach, Muskelbündel sehr fein und ziemlich weitläufig, sich rechtwinklig und schräg schneidend.

Tetankel: zusammengesetzt, fiederartig verästelt, ca. 12, von verschiedener Grösse, ohne jede Regelmässigkeit in der Anordnung.

Kiemensack: jederseits mit 7 Falten; 7-9 innere Längsgefässe auf jeder Falte, 6 in den Faltenzwischenräumen. Kiemenspalten gebogen, in grossen, ziemlich tiefen Infundibula spiralig angeordnet,

Zahl der Windungen über 12; je 1 Längsreihe von Infundibula entlang einer Falte, Basis der Infundibula quadratisch. Radiale Gefäße vorhanden. Peripharyngealband stark wellig.

Flimmerorgan: sehr einfach, Öffnung schlitzförmig, längsgestellt.

Dorsalfalte: breit, glattrandig.

Darm: linksseitig eine lange, fast geschlossene Schlinge bildend; an der Umbiegungsstelle der Darmschlinge eine kleine Öse, die die Gonade umfaßt. Magen längsgefaltet, After glattrandig.

Exkretionsorgan: eine ganz kleine ovale Nierenblase an der rechten Seite, dem hinteren Körperende genähert.

Geschlechtsorgane: beiderseits eine zwitterige Gonade von ovalem Umriss; die linke in der engen Darmschlinge, die rechte oberhalb der Nierenblase, senkrecht zur Längsachse derselben.

Fundnotiz: Kyushu, bei Insel Goto; 1 Exemplar.

Anmerkung. Diese interessante Art stimmt in der Lage der linken Gonade innerhalb der Darmschlinge mit der vorigen Art überein, von der sie jedoch in allen andern Punkten stark abweicht. Im Bau des Kiemensackes kommt diese Art der *Molgula eugyroides* Traustedt aus Westindien und einigen von Sluiter beschriebenen Siboga-Arten, wie *M. crinita* und *M. sordida* sehr nahe, unterscheidet sich aber von allen diesen schon durch die eigentümlich gelagerten Gonaden.

6. *Molgula aidae* n. sp.

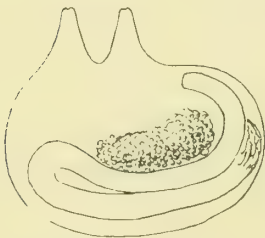


Fig. 11.
Molgula aidae. Von links. $\times 1$.



Fig. 12.
Molgula aidae. Von rechts. $\times 1$.

Äussere Kennzeichen. Körper oval, seitlich etwas zusammengedrückt; Länge 48 mm, Breite 33 mm.

Siphonen mässig lang, kegelförmig, an der Basis sich berührend; beide median, an der Vorderfläche, dem ventralen Rande genähert; Ingestionsöffnung 6-lappig, Egestionsöffnung 4-lappig.

Oberfläche vollständig mit groben Sandkörnern und Muschelfragmenten bedeckt.

Testa: nicht besonders dick, aber zäh, durchscheinend weiss, überall mit sehr feinen, ziemlich langen, spärlich verästelten Haftfaden ausgestattet.

Tunica: im allgemeinen dünn und durchsichtig; Muskulatur der Siphonen wohl entwickelt, besonders die derben, von ihrer Basis ausstrahlenden Längsbündeln.

Tentakel: zusammengesetzt, reichlich verästelt, etwa 16, grössere und kleinere ziemlich regelmässig alternierend.

Kiemensack: jederseits mit 7 Falten, von denen die erste merklich schmäler ist als die übrigen; 7-8 innere Längsgefässe auf jeder Falte, keine in den Faltenzwischenräumen. Kiemenspalten lang oder kurz, gerade oder wenig gebogen, an den Falten unregelmässig spiralförmige Figuren bildend, in den Faltenzwischenräumen einfach in der Längsrichtung parallel angeordnet.

Flimmerorgan: hufeisenförmig, beide Hörner eingerollt; Öffnung nach rechts gewandt.

Dorsalfalte: schmal, dünn, glattrandig.

Darm: linksseitig eine lange schmale Schlinge bildend; Magen mit wohl entwickelten Leberlappen; After glattrandig, dem Kiemensack anliegend.

Exkretionsorgan: eine lange, nicht besonders dicke, wenig gebogene Nierenblase an der rechten Seite, dem hinteren Medianlinie genähert.

Geschlechtsorgane: beiderseits eine längliche zwitterige Gonade, die linke oberhalb der Darmschlinge, die rechte oberhalb der Nierenblase.

Fundnotiz: Kyushu, Misumi-Haven (Coll. T. Aida); 1 Exemplar.

Anmerkung. Obwohl diese Art keine besonderen anatomischen Merkmale bietet, konnte ich sie doch nicht mit keiner der beschriebenen Arten identifizieren. In der Lage und Gestalt der Darmschlinge, der Gonaden und der Nierenblase kommt diese Art der *M. septentrionalis* Traustedt sehr nahe, unterscheidet sich aber von ihr durch den abweichenden Bau des Kiemensackes.

7. *Molgula hartmeyeri* n. sp.



Fig. 13.

Molgula hartmeyeri. Von links. $\times 2$.



Fig. 14.

Molgula hartmeyeri. Von rechts. $\times 2$.

Äussere Kennzeichen. Körper eiförmig, breiter als hoch, seitlich etwas zusammengedrückt, frei; Höhe 19 mm, Breite 22 mm.

Siphonen sehr kurz, die Öffnungen äusserlich nicht sichtbar, etwa $\frac{1}{6}$ des medianen Körperumfanges von einander entfernt, beide median an der Vorderfläche; Ingestionsöffnung 6-lappig, Egestionsöffnung 4-lappig.

Oberfläche vollständig mit einer dichten Lage von groben Sandkörnern bedeckt, die an den Haftfaden der Testa anhaften.

Testa: dünn aber ziemlich zäh, durchscheinend weiss, überall mit feinen, ziemlich langen, verästelten Haftfaden ausgestattet.

Tunica: im allgemeinen nicht dick, die bindegewebige Grundsubstanz weich, durchscheinend; Siphonensmuskeln wohlentwickelt; in der vorderen Körperhälfte ein System von eigentümlichen kurzen Muskelbündeln, die an der Aussenseite der von den Siphonen aus-

strahlenden derben Längsmuskelbündeln liegen und diese senkrecht schneiden.

Tentakel: zusammengesetzt, baumartig verästelt, ca. 12, von zweierlei Grössen, daneben noch einige ganz kleine, einfachere.

Kiemensack: jederseits mit 7 Falten; 10–12 innere Längsfässer auf jeder Falte, 0 in den Faltenzwischenräumen. Infundibula in regelmässigen Längs- und Querreihen angeordnet, trichterförmig, in den Falteninnenraum hineinragend. Kiemenspalten lang, schwach gebogen; in den Faltenzwischenräumen längsgestellt, meist an den Enden hakenförmig gekrümmt.

Flimmerorgan: flach hufeisenförmig, mit einfach endigenden Schenkeln; Öffnung schräg nach vorn und rechts gewandt.

Dorsalfalte: niedrig, glattrandig, nicht gerippt.

Darm: linksseitig eine längliche Schlinge bildend; Magen glattwandig, ohne Leberlappen, nicht scharf vom Mitteldarm abgesetzt; After glattrandig.

Exkretionsorgan: eine grosse dick-wurstförmige Nierenblase an der rechten Seite in der hintern Körperhälfte.

Geschlechtsorgane: beiderseits eine diffuse zwitterige Gonade; die Hauptmasse der linken Gonade innerhalb und oberhalb der Darmschlinge, die der rechten Gonade oberhalb der Nierenblase; periphere Partien der Gonaden strahlenartig in die Zwischenräume zwischen den derberen Längsmuskelbündeln eindringend. Jede Gonade aus unzähligen kleinen Hoden- und Ovarialfollikeln bestehend, die durcheinander gemischt liegen.

Fundnotiz: Kyushu, bei Insel Goto; 3 Exemplare.

Anmerkung. Diese interessante Art zeichnet sich vor allem durch die eigentümliche Gestaltung der Geschlechtsdrüsen aus, die sich diffus über den grösseren Teil der Tunica ausbreiten und keine scharfe Abgrenzungslinie erkennen lassen. In der Anordnung der Muskelbündeln im Weichkörper stimmt diese Art mit der *M. japonica* Hartmeyer ziemlich gut überein, der sie auch im äusseren Habitus sehr ähnlich sieht.

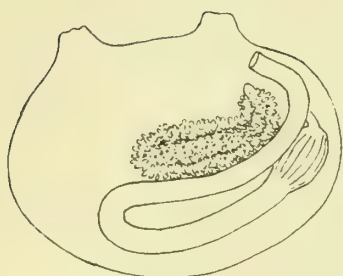
8. *Molgula xenophora* n. sp.

Fig. 15.

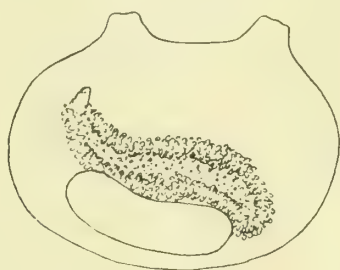
Molgula xenophora. Von links. $\times 1.5$.

Fig. 16.

Molgula xenophora. Von rechts. $\times 1.5$.

Äussere Kennzeichen. Körper rundlich oval, frei; Länge 26 mm, Breite 19 mm, Querschnitt fast kreisrund.

Siphonen sehr kurz, Öffnungen äusserlich nicht erkennbar, ungefähr $\frac{1}{6}$ des medianen Körperumfanges von einander entfernt, beide an der Vorderfläche; Ingestionsöffnung 6-lappig, Egestionsöffnung 4-lappig.

Oberfläche mit einer Anzahl verhältnismässig sehr grosser vollständig erhaltener Muschelschalen bedeckt, daher wie ein Haufen leerer Schalenstücke aussehend; Körperhaut zwischen den Muschelschalen dunkelgrau wegen anhaftender Schlammteilchen; Haftfaden der Testa sammetartig über die Schlammteilchenschicht hervortretend.

Testa: dünn, häutig, ziemlich zäh, weisslich; überall mit feinen langen Haftfaden besetzt.

Tunica: dünn durchsichtig; Muskulatur am Körper nicht besonders kräftig, mit einem System eigentümlicher kurzer Muskeln, wie bei der vorigen Art.

Tentakel: zusammengesetzt, Stamm vertikal verbreitert, Seitenzweige nicht dick, Fiederung bis 3. Ordnung; ca. 16, grössere und kleinere regelmässig alternierend; daneben noch eine Anzahl ganz kleiner.

Kiemensack: jederseits mit 7 breiten Falten; 13–14 innere

Längsgefässe auf jeder Falte, 2-3 in jedem Faltenzwischenraum. Quergefässe 1. bis 3. Ordnung, nach dem Schema 1 3 2 3 1; Quergefässe 3. Ordnung sehr kurz, auf die Randpartien der Falten beschränkt. Infundibula sehr tief, trichterförmig in den Falteninnenraum hineinragend und bis fast an den Faltenrand hin reichend. Kiemen-spalten lang, schwach gebogen, in den Faltenzwischenräumen längs-gestellt.

Flimmerorgan: breit hufeisenförmig, die Hörner nicht einge-
rollt; Öffnung nach rechts und ein wenig nach vorn gewandt.

Dorsalfalte: schmal, glatt, glattrandig.

Darm: linksscitig eine lange enge Schlinge bildend; Magen oval,
längsgefaltet; After glattrandig.

Exkretionsorgan: eine ziemlich grosse, schwach gebogene,
wurstförmige Nierenblase an der rechten Seite in der hinteren Kör-
perhälfte.

Geschlechtsorgane: beiderseits eine langgestreckte, schwach
gebogene zwitterige Gonade, die aber deutlich in medianes Ovarium
und laterale Hoden gesondert ist; die linke Gonade oberhalb der
Darmschlinge, die rechte oberhalb der Nierenblase, parallel derselben.

Fundnotiz. Japanisches Meer, bei Idsumozaki, Prov. Echigo
(Coll. M. Nakamura); 3 Exemplare.

Anmerkung. Diese Art unterscheidet sich von allen andern
japanischen *Molgula*-Arten hauptsächlich durch den eigentümlichen
äusseren Habitus, der unwillkürlich an die Schneckengattung *Xenophora*
erinnert, deren Schale ebenfalls mit leeren Molluskenschalen bedeckt
ist. Betreffend der inneren Anatomie weist sie keine auffälligen
Eigentümlichkeiten auf, liess sich dennoch mit keiner der bekannten
Arten identifizieren.

Über eine neue Art von *Trichostrongylus* aus dem Darne des Menschen in Japan, (*Trichostrongylus orientalis* n. sp.).

Von

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Hierzu Taf. V.

Im Darne der Japaner habe ich mehrfach eine der Nematodengattung *Trichostrongylus* Looss unverkennbar angehörige Art gefunden, welche, nach einer genaueren Untersuchung, sich als eine mit keinen der bisher bekannten Arten jener Gattung vereinbare Form herausstellte.¹⁾ Herr Professor Ijima, den ich in der Sache zu Rate zog, ist auch der Ansicht, dass es nötig sei, den Parasiten mit einer besonderen Bezeichnung zu belegen, und seinem Vorschlage nach gebe ich ihm den Namen *Trichostrongylus orientalis*.

Schon 1889 hatte Ogata²⁾ über einen kleinen Fadenwurm berichtet, den er zu Hunderten im Magen einer verstorbenen Japanerin entdeckte und welche später von Ijima³⁾ unter dem Namen *Strongylus subtilis* Looss 1895 (= *Trichostrongylus instabilis* Railliet 1893) näher beschrieben wurde. Leider ist kein Exemplar des Ogata-Ijima'schen *Trichostrongylus* in Erhaltung geblieben, sodass ein direkter Vergleich desselben mit der von mir aufgefundenen Art nicht mehr unternommen werden kann. Jedoch ist Herr Prof. Ijima jetzt stark der Ansicht geneigt, dass sein *Strongylus subtilis* mit meinem *Tr. orientalis* identisch ist; jedenfalls weiss er keinen Grund mehr die Richtigkeit seiner damaligen Identifizierung auch heute zu behaupten. Auch das neulich durch Kitamura und Oishi⁴⁾ bekannt gewordene Vorkommen von *Strongylus subtilis* als menschliche Darmparasiten in SüdJapan und

Korea scheint mir höchst wahrscheinlich sich nicht auf jene Art, sondern auf *Tr. orientalis* zu beziehen.

Was nun das Material, welches der genannten neuen Art zugrunde liegt, anbelangt, so habe ich es hauptsächlich aus 27 (unter 57 darauf untersuchten) Leichen entnommen. Als der Sitz des Parasiten ist stets das Duodenum, in einigen Fällen auch der Magen und der obere Teil des Jejunums, anzuführen. Er wurde meistens in sehr geringer Individuenzahl, zwar unter 10 und nur ausnahmsweise 50 oder noch darüber, angetroffen. Ausser den Leichen habe ich 5 Patienten unter Behandlung gehabt, die mit demselben Parasiten behaftet und die mir von Zeit zu Zeit frisches Material lieferten. Im Ganzen, die aus den erwähnten Wirten erhaltenen Würmer betragen 219, wovon 56 Männchen und 163 Weibchen sind.

Meines Wissens sind bis jetzt nur vier Arten von *Trichostrongylus* bekannt gewesen,—also diejenigen vier Arten, welche Looss schon bei der Aufstellung der genannten Gattung zusammengestellt und systematisch auseinandergesetzt hat. Es sind nämlich *Tr. retortaeformis* (Zeder 1800), *Tr. instabilis* (Railliet 1893), *Tr. probolurus* (Railliet 1896) und *Tr. vitrinus* (Looss 1905). In allgemeinem Aussehen sowohl wie in baulicher Hinsicht stimmt nun *Tr. orientalis* mit ihm wesentlich überein mit *Tr. instabilis* (= *Strongylus subtilis* Looss), von welchem Looss⁹⁾ auch schon früher eingehende Beschreibung und Abbildungen gegeben hat.

Es handelt sich also um dünnen und zarten Fadenwürmern (Taf. V, Fig. 1.) von grauweisslicher Farbe oder fast farblosem Aussehen; Körperlänge im geschlechtstreifen Zustande 4.8–3.8 mm bei Männchen, und 6.7–4.9 mm bei Weibchen; beide Geschlechter am dicksten in der Gegend der Genitalöffnung, von welcher sich der Körper nach vorn allmählich und gleichmässig verjüngt; Körperbreite beim Männchen direkt vor den Spicula 0,079–0,072 mm, am Kopfende ca. 0,007 mm; dieselbe beim Weibchen auf der Höhe der Vulva 0,083–0,075 mm, am Kopfende ca. 0,090 mm. Haut mit Querringelung, doch ohne Längskanten. Mundöffnung mit drei knötchenförmigen Papillen versehen,

sonst mit keinerlei charakteristischer Ausstattung. Oesophagus einfach, etwa 0,8 mm lang, mit ebenso beträchtlicher Variation wie die Körperlänge. Gehirn und Excretionsporus ca. 0,1 mm hinter dem Kopfende. Beim Männchen beginnt der Hodenschlauch etwa 0,06 mm hinter dem Oesophagealende; Bursallappen in ausgebreitetem Zustande (Fig. 2) ca. 0,23 mm breit in transversaler Richtung, jede Lappen ca. 0,13 mm breit an der Basis in dorsoventraler Richtung. Beim Weibchen Vulvaröffnung in der hinteren Körperhälfte, 1,47–0,84 mm vom Schwanzende entfernt; Uterus enthält 10–20, meist noch nicht in Furchung gelangte Eier; vorderes Eirohr erreicht vorn eine etwa 1,0 mm vom Kopfende entfernte Stelle, biegt da zurück, und endet nach einer weiteren kurzen Strecke; das hintere zieht nach hinten bis etwa 0,15 mm Entfernung von der Schwanzspitze heran, kehrt dort um, dann kommt vorn an die Höhe von etwa 1,4 mm Entfernung vom vorderen Ende, sodann kehrt wieder um, um schliesslich nach einem hinterwärts gerichteten ca. 0,3 mm langen Verlaufe zu endigen.

Von besonderer taxonomischen Wichtigkeit, in Bezug auf die von Looss niedergelegten Diagnosen anderer Mitglieder der Gattung, sind aber die folgende Charaktere:

Männchen: Bursallappen jederseits mit zwei weit auseinanderweichenden Ventralrippen; von diesen die ventroventrale dünn, isoliert ventralwärts gerichtet; die lateroventrale sehr dick, dicht an der Externolateralrippe gelagert. Letztere fast gleich dick wie die lateroventrale, und wiederum in fast ganzer Länge direkt an der leicht schlänkeren Mediolateralrippe gelagert. Posterolateralrippe noch etwas dünner und merklich kürzer, fast gerade, jedenfalls gar nicht dorsalwärts gebogen, sich divergierend von der vorhergehenden Rippe nur in dem distalen Drittel ihrer Länge, mit dem Ende bis kurz vor den Bursalrand heranreichend. Externodorsalrippe kürzer als die letztere Rippe, schwach s-förmig gebogen, die Endpapille etwa halbwegs zwischen den Enden der beiden angrenzenden Rippen. Die eigentümliche Biegung der in Rede stehenden Rippe bildet ein auffälliges Merkmal

der Art. Die unpaare Dorsalrippe am Ende gespaltet, die ganze Länge etwa 0,032 mm (einschliesslich 0,011 mm lange Gabeläste).—Die beiden spicula 0,133–0,119 mm lang, nach hinten schlank ausgezogen, bräunlich gelb; Endhaken winzig, kurz vor der Spitze gelagert, sodass der Endabschnitt des Spiculums von einem unbedeutenden Umfang ist oder vielmehr fast wie schläg abgeschnitten aussieht; sonstige Gestalt der Spicula aus Fig. 3 zu ersehen.—Gubernaculum 0,085–0,065 mm lang, grösste Breite etwa 0,018 mm, blassgelblich; Gestalt in frontaler Ansicht aus Fig. 3 zu ersehen, im Profile länglich spindelförmig, nur ganz schwach convex und nicht wellig gebogen an der Dorsalseite.

Weibchen: Der länglich konische postanale Körperteil 0,086–0,065 mm lang, öfters etwas ventralwärts gebogen (Fig. 4).—Vulvaröffnung stellt eine etwas unregelmässig gebogene Querspalte von ca. 0,022 mm Länge dar. Vagina ca. 0,05 mm lang, nach innen ein wenig schief vorwärts gerichtet. Der gemeinsame Abschnitt der Ovejektoren zwischen den beiden deutlich hervortretenden, ersten Einschnürungen 0,222–0,194 mm lang; ein kleines 0,036–0,029 mm langes Endstück desselben direkt vor der genannten Einschnürung bei jedem Ovejektore ausgezeichnet durch dichtere und bulböse Ausbildung des Wandes; darauf folgt ein bauchiger, ca. 0,061–0,059 mm langer und ca. 0,038 mm dicker Abschnitt, welcher nach hinten resp. vorn durch eine zweite augenfällige Einschnürung begrenzt ist und wahrscheinlich der Looss'schen Abteilung I. entspricht⁷⁾; danach kommt noch der kleinere, elliptische, ca. 0,04–0,32 mm lange und 0,047 mm dicke Abschnitt (Looss'scher II.) mit ausgeprägt dichtmuskulöser Wandung, und schliesslich der dem Uterus angrenzende, verlängerte und verhältnismässig dünnwandige letzte Abschnitt (Looss'scher III.) von ca. 0,108–0,09 mm Länge; Grösse der Eier im Uterus: 0,091–0,075 mm lang und 0,047–0,039 breit.

Beim Vergleich der Obenmitgeteilten mit den Angaben-Looss's über die bis jetzt bekannten *Trichostrongylus*-Arten (l. c.), besonders

in Bezug auf die Charaktere der Spikulen, des Gubernaculums und Bursalrippen beim Männchen, sowohl wie des postanalen Körperteils und des Ovejektors beim Weibchen, wird man leicht zur Überzeugung kommen, dass der vorliegende *Trichostrongylus* eine eigenartig charakterisierte und leicht unterscheidbare Art darstellt.

Es scheint nun, dass diese Art eine der in Japan sehr weit verbreiteten menschlichen Darmparasiten darstellt, und sie wäre in ihrem Vorkommen gar nicht als eine seltene zu bezeichnen sein. Offenbar war die Kleinheit des Körpers viel daran schuldig, dass der Wurm nicht so häufig unter Beobachtung kam wie es sonst der Fall gewesen wäre. Bei der Stuhluntersuchung der Patienten müssten die Aertzte schon öfters die Eier des Wurmes vor sich gehabt haben, aber es liegt hier die Gedanke nahe, dass sie ohne weiters für die des *Ankylostomum duodenale* gehalten wurden. Den Fehler dieser vorciligen Bestimmung hätte man vermeiden können, würde man nur genauer die Grösse und Beschaffenheit der Eier verglichen haben. Zur Veranschaulichung des Unterschieds beider Ei-Arten diene Fig. 5, welche von einem die beiden enthaltenden Stuhlpreparat entnommen ist.

Klinische Beobachtungen auf den mit dem oben beschriebenen Parasiten behafteten Patienten werden am anderen Orte berichtet. Nur sei hier erwähnt, dass der Parasit, so weit wie meine bisherige Erfahrung reicht, keinen bedeutenden pathologischen Einfluss auf den menschlichen Wirten auszuüben scheint.

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 - 6) A. Looss, Centralbl. f. Bakt. etc. Bd. 18, p. 161, Taf. I. 1895.
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Erklärung des Tafel V.

- Fig. 1. *Trichostrongylus orientalis* n. sp. Oben, das Weibchen ; unten, das Männchen ; beide in 15-facher Vergrößerung.
- Fig. 2. Hinteres Körperende des Männchen mit ausgebreiteten Bursallappen. In 246-facher Vergrößerung.
- Fig. 3. Spicula und Gubernaculum des Männchen in 480-facher Vergrößerung.
- Fig. 4. Hinteres Körperende des Weibchen in 500-facher Vergrößerung. an, Anus.
- Fig. 5. Bild des Stuhlpreparates von einem mit *Tr. orientalis* und *Ankylostomum duodenale* behafteten Patienten, 140-fach vergrößert. Die zwei grösseren Eier in der Mitte der Figur sind die des *Tr. orientalis*, die vier anderen^{er} sind die des *Ankylostomum*.
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The Synaptidæ of Japan.

By

Hiroshi Ohshima, *Rigakushi*.

In his "List of Holothurians known to occur in Japan"¹⁾ the late Prof. K. Mitsukuri gave seven species of Synaptids, founded on the reports of v. Marenzeller and Théel. They are: 1) *Synapta incerta*, var. *variabilis* Théel [= *Labidoplax dubia* (Semper)]; 2) *S. ooplax* v. Marenzeller [= *Leptosynapta ooplax*]; 3) *S. distincta* v. Marenzeller [= *Protankyra bidentata* (Woodward et Barrett)]; 4) *S. autopista* v. Marenzeller [= *Protankyra autopista*]; 5) *S. aculeata* Théel [= *Protankyra aculeata*]; 6) *Chiridota japonica* v. Marenzeller [= *Scoliodota japonica*]; and 7) *Ch. rufescens* Brandt [= *Polycheira rufescens*].

Since that time four more species have been reported from Japan and adjacent localities, viz., 1) *Myriotrochus minutus* Östergren; 2) *Anapta ludwigi* Britten; 3) *A. amurensis* Britten; and 4) *Chiridota regalis* Clark.

To the above list of eleven Synaptid species, I have added seven more, besides an indeterminable form, in my report on the Holothurians collected by the "Albatross" off the coasts of Japan, which report will shortly be published in another place. Further, from examination of the Synaptidæ in the Science College Museum, I have come to know that there still existed five more species, including one new species, to be added to the list, thus bringing the number of Synaptid species occurring in the waters around Japan, up to twenty-three altogether.

I here propose to present brief notes on all these Synaptids, to supplement in a way the late Professor Mitsukuri's excellent mono-

1) Zoological Magazine, vol. VIII, no. 97, 1896.

graph on pedate Holothurians.¹⁾ In the matter of classification I follow Dr. H. L. Clark.²⁾

Family SYNAPTIDÆ.

Subfamily I. SYNAPTINÆ.

1. *Synapta maculata* (Chamisso et Eysenhardt).

Holothuria maculata Chamisso et Eysenhardt, Nov. Act. Acad. Leop.-Carol., Pasc. II, vol. X, 1821, p. 352; pl. XXV.

Synapta maculata Clark, The Apodous Holothurians, 1907, pp. 23, 78-79; pls. I; IV, figs. 17-19, 26.

Two specimens. Under Nami-no-Uyé Temple (tide pool), Napha, Okinawa, Liu-Kiu Islands. Mitsukuri, Ikeda, etc. coll. Apr., 1901. (Cat. no. 1184).

This species, hitherto known from numerous localities throughout the Indo-Pacific region, is now found to extend north to the Liu-Kiu Islands. Mr. S. Hozawa tells me that he and his party observed gigantic Synaptids at Kōshun, near the south end of Formosa. It is exceedingly probable that they had this remarkable species before them.

2. *Leptosynapta inhærens* (O. F. Müller).

Holothuria inhærens O. F. Müller, Zool. Dan. Prodr., 1776, p. 232.

Leptosynapta inhærens Verrill, Trans. Conn. Acad., 1867, vol. I, p. 325.—Clark, The Apodous Holothurians, 1907, pp. 23-24, 88-89; pl. V, figs. 14, 18-20.—Becher, Beitr. z. Morphol. u. Systemat. d. Paractinopod., 1910, pp. 316-348; pl. XX, figs. 2, 3; pl. XXII, figs.

1) Studies on Actinopodous Holothurioidæ. Jour. Coll. Sci., Imp. Univ., Tokyo. Vol. XXIX, Art. 2, 1912.

2) The Apodous Holothurians. Smithsonian Contributions to Knowledge, Vol. XXXV, 1907.

9-12; pl. XXIII, figs. 1-13; pl. XXIV, figs. 14-17.—Ohshima, Synaptiden von Misaki,¹⁾ 1913, pp. 253-254; pl. VI, fig. 4.

Many specimens. Kurokami-Mura, Sakura Jima, Kagoshima Bay, Kyūshū. Azuma coll. (Cat. no. 1122).

Many specimens. Enoura, Suruga Bay, Honshū. Apr., 1884. (Cat. no. 1823).

One specimen. Jōga Shima, Misaki. (Cat. no. 1826).

Several specimens, reared in aquarium at Misaki. Ohshima. Jan., 1911. (Cat. no. 1804).

Several specimens. Katsuura, Chiba Prefecture. Ohshima coll. Aug. 15-16, 1913. (Cat. no. 1838).

Color either pure white or light brown with fine pigments scattered over body. Largest specimens do not exceed 50 mm. in length. Each tentacle beset with 9 or 11 digits. Anchors 65-195 μ long, anchor plates 70-150 μ long. The terminal hole of anchor-plate usually markedly larger than any of the others as was noticed by Becher, and often divided into two or three small holes. In these and all other characters the specimens answer well to descriptions of the Atlantic form.

3. *Leptosynapta ooplax* (v. Marenzeller).

Synapta ooplax v. Marenzeller, Neue Holothurien von Japan und China, 1881, pp. 122-123; pl. IV, figs. 1, 1 A-D.—Britten, Holothurien a. d. japan. u. ochotsk. Meere, 1907, pp. 150-152.

Leptosynapta ooplax Clark, The Apodous Holothurians, 1907, pp. 24, 90-91.—Ohshima, Synaptiden von Misaki, 1913, pp. 254-255; pl. VI, fig. 5.

One specimen. Sakibaru, Napha (coral reef), Okinawa, Liu-Kiu Islands. Mitsukuri coll. Apr. 7, 1901. (Cat. no. 1769).

1) Zoological Magazine, vol. XXV, no. 295, 1913, pp. 253-262; pl. VI. (Japanese, with an abstract in German).

One specimen. Makurazaki, Kagoshima Prefecture, Kyūshū. Miyajima coll. Aug. 5, 1900. (Cat. no. 1121).

One specimen. Kashiwajima, west of Shikoku. Tago coll. Mar. 22, 1905. (Cat. no. 1783).

Many specimens. Tsuru-Mura, Province Tosa, Shikoku. Tago coll. Feb. 18, 1905. (Cat. no. 1781).

Two specimens. West coast of Tsuru-Mura, Province Tosa, Shikoku. Tago coll. Feb. 16, 1905. (Cat. no. 1780).

Several specimens. Gogo Shima, Province Iyo, Shikoku. Ikeda and Takeshita coll. July, 1903. (Cat. no. 1785).

Many specimens. Agu Bay, Province Shima, Honshū. Nishikawa coll. Oct. 29, 1905. (Cat. no. 1788).

Many specimens. Koajiro, Misaki. July 17, 1890. (Cat. no. 1814).

Several specimens. Koajiro, Misaki. Mitsukuri coll. Aug. 12, 1897. (Cat. no. 1120).

Eight specimens. Aburatsubo Bay, Misaki. (Cat. no. 1856).

Several specimens. Aburatsubo Bay, Misaki. Ohshima coll. Jan. 7, 1911. (Cat. no. 1806).

Several specimens. Aburatsubo Bay, Misaki. Ohshima coll. Aug. 11, 1910. (Cat. no. 1803).

In all the specimens before me, the anchors measure 115–195 μ and the anchor-plates 57–135 μ in length. For precise description of the species I refer to Britten and Clark.

4. *Labidoplax dubia* (Semper).

Synapta dubia Semper, Holothurien, 1867-'68, p. 10; pl. IV, fig. 11; pl. V, fig. 14; pl. VIII, figs. 4, 16.

Labidoplax dubia Östergren, Das System der Synaptiden, 1898, p. 116.—Clark, The Arodous Holothurians, 1907, pp. 24, 96–97; pl. V, figs. 25, 28.

Four fragments. Izugahara Bay, Tsushima Islands, northwest of Kyūshū. Namiyé and Tsuchida coll. Feb., 1891. (Cat. no. 1789).

Anchors 110–155 μ , and anchor-plates 90–140 μ long. Thus, the specimens now before me agree better with the “Challenger” specimens described by Théel than with those of the “Albatross” described by Clark.

5. *Protankyra bidentata* (Woodward et Barrett).

Synapta bidentata Woodward et Barrett, Proc. Zool. Soc., London, vol. XXVI, 1858, p. 365; pl. XIV, figs. 23–25.

Synapta distincta v. Marenzeller, Neue Holothurien von Japan und China, 1881, p. 123; pl. IV, fig. 2.—Théel, Challenger Holothurioidea, part 2, 1886, p. 11; pl. I, fig. 8.

Protankyra bidentata Östergren, Das System der Synaptiden, 1898, p. 117.—Clark, The Apodous Holothurians, 1907, pp. 102–103; pl. V, fig. 30.—Ohshima, Synaptiden von Misaki, 1913, pp. 256–258, 261; pl. VI, figs. 7, 8.

Six specimens. Kagoshima (?). Nakagawa coll. (Cat. no. 1117).

One specimen. Shimabara, Province Hizen, Kyūshū. Kaneko coll. (Cat. no. 1763).

Many specimens. 2.5 miles off Tekama-Mura, Miike, Fukuoka Prefecture, Kyūshū. Azuma coll. Mar. 31, 1904. (Cat. no. 1779).

One specimen. Gogo Shima, Province Iyo, Shikoku. Ikeda and Takeshita coll. July, 1903. (Cat. no. 1827).

Several specimens. Hachihama, Kojima Bay, Inland Sea. Izuka coll. (?) Oct., 1899. (Cat. no. 1670).

Six specimens. Kojima Bay, Inland Sea. Izuka coll. Dec. 21, 1906. (Cat. no. 1761).

Two specimens. Kojima Bay (Shore), Inland Sea. Izuka coll. Dec. 21, 1906. (Catalog. no. 1667).

Many specimens. Hachihama, Kojima Bay, Inland Sea. Nishikawa don. (Cat. no. 1118).

Two specimens. Nanao Bay, Province Noto, Honshū. Yamashina coll., Ichimura don. Nov. 4, 1902. (Cat. no. 1791).

Three fragments. Nanao, Province Noto, Honshū. (Cat. no. 1119).

One specimen. Okinose, inside, Sagami Sea, 300-400 *hiro* (=ca. 240-310 fathoms). Aoki coll. March 7, 1895. (Cat. no. 1669).

Three specimens. Koajiro, Misaki. (Cat. no. 1815).

Several specimens. Koajiro, Misaki. Aug., 1887. (Cat. no. 1668).

Two specimens. Koajiro (Shore), Misaki. July 17, 1890. (Cat. no. 1116).

It may be worthy of note that this littoral species may occur at a depth of 240-310 fathoms (no. 1669). This species has been reported before from Miya Bay (v. Marenzeller) and from the "Challenger" Station 233 B, off Sanuki, Inland Sea, 8-50 fathoms (Théel).

In a former paper I made notice of spicules being of very different sizes in radii and interradii. I now find in some specimens that that arrangement is not quite distinctly carried out; nevertheless the anchors and anchor-plates are largest in the middle part of interradii and decrease in size towards radii. Anchors range 170-545 μ and anchor-plates 140-430 μ in length. Large anchors in interradii show on each arm ten or more minute teeth.

6. *Protankyra autopista* (v. Marenzeller).

Synapta autopista v. Marenzeller, Neue Holothurien von Japan und China, 1881, p. 123; pl. IV, fig. 3.—Britten, Holothurien a. d. japan. u. ochotsk. Meere, 1907, pp. 147-150.

Protankyra autopista Östergren, Das System der Synaptiden, 1898, p. 117.—Clark, The Apodous Holothurians, 1907, p. 103; pl. V, fig. 31.—Ohshima, Synaptiden von Misaki, 1913, pp. 255-256; pl. VI, fig. 6.

Two specimens. *Balanoglossus*-beach, Misaki. Izuka coll. Apr. 2, 1904. (Cat. no. 1801).

Several specimens. *Balanoglossus*-beach, Misaki. Aug. 23, 1899. (Cat. no. 1802).

One specimen. *Veretillum*-beach, Moroiso, Misaki. Mitsukuri coll. Aug. 12, 1897. (Cat. no. 1825).

This species is fairly well distinguishable from the preceding by the following characteristics. Length of anchors $86-140\mu$ nearly always shorter than wide; each arm of anchor with one or two large teeth near end, which very often assumes bifurcate appearance on their account; handle of anchor fan-shaped, instead of T-shaped; anchor-plates irregularly quadrangular, $86-125\mu$ long, commonly with a pair of large holes near centre; miliary granules not X-shaped, but are cup-shaped buttons, $30-50\mu$ in diameter, each perforated by 3-10 holes; in the radii there are found deeply imbedded smooth, oval granules, 20μ in diameter.

The species has before been reported from Miya Bay (v. Marenzeller) and from Misaki (Britten). Britten's statement that it is known from Amoy through Ludwig is a mistake, probably based on confounding the species with the preceding.

7. *Protankyra aculeata* (Théel).

Synapta aculeata Théel, Challenger Holothurioidea, part 2, 1886, pp. 13-14; pl. I, figs. 2 a-f.

Protankyra aculeata Östergren, Das System der Synaptiden, 1898, p. 117.—Clark, The Apodous Holothurians, 1907, p. 104.

Since a fragment was obtained by the "Challenger" at her Station 232, Sagami Bay, no other occurrence has been recorded.

8. *Protankyra kagoshimensis* Ohshima.

Protankyra kagoshimensis Ohshima, Albatross Holothurians (m.s.).

This species is known only from the "Albatross" Station 4945, Kagoshima Bay, Kyūshū.

9. *Anapta ludwigi* Britten.

Anapta ludwigi Britten, Holothurien a. d. japan. u. ochotsk. Meere, 1907, pp. 152-153.

This form known from Southern Saghalien is represented in the

Sci. Coll. collection by twelve specimens from Chibisani, Saghalien, 18 *hiro* (=ca. 14 fathoms), collected by Prof. Ijima on Aug. 22, 1906 (Cat. no. 1795).

The largest specimen measures 80 mm. long] and 6 mm. across. Pigment spots present in skin, but discernible only under the microscope. In two specimens opened, Polian vesicles were found numbering 14 and 17 respectively.

10. *Anapta amurensis* Britten.

Anapta amurensis Britten, Holothurien a. d. japan. u. ochotsk. Meere, 1907, pp. 153-154.

Britten based the species on specimens from the mouth of the Amur and from an unknown locality. No second record of its occurrence has since been given.

Subfamily II. CHIRIDOTINÆ.

11. *Chiridota regalis* Clark.

Chiridota regalis Clark, The Apodous Holothurians, 1907, pp. 28, 117.

The species was obtained by the "Albatross" from off the south coast of Honshū (Station 3695) and from Suruga Bay (Station 3737). I have no specimens of it at my disposal.

12. *Chiridota uniserialis* Fisher.

Chiridota uniserialis Fisher, Hawaiian Holothurians, 1907, pp. 733-735; pl. LXXXI, fig. 4; pl. LXXXII, figs. 5, 5 a-c.

Two fragments probably belonging to one individual. South of Jōga Shima, Sagami Sea (Sengenzuka-line, inside). 400 *hiro* (=ca. 310 fathoms). Aoki coll. Feb. 26, 1897. (Cat. no. 1115).

When fresh the specimen is said to have been "pink on the five muscle bands, transparent in other parts" and wheel-papillæ to have

been flat. Length, as measured on the two fragments put together, 120 mm.; diameter 9 mm. Each of the twelve tentacles bears five pairs of digits. Polian vesicles five.

The specimen agrees very well in characters with those from Hawaii as described by Fisher.

13. *Chiridota discolor* Eschscholtz.

Chiridota discolor Eschscholtz, Zoologischer Atlas, 1829, pp. 12-13; pl. X, fig. 2.—Clark, The Apodous Holothurians, 1907, pp. 26-28, 120.—Ohshima, Albatross Holothurians (m.s.).

Besides several stations in Alaska, Aleutian Islands and Bering Islands, the present species has also been reported from Okhotsk Sea (Grube) and from Robben Island (Clark).

14. *Chiridota albatrossii* Edwards.

Chiridota albatrossii Edwards, Albatross Holothurians, 1907, pp. 50-52; textfigs. 1 a-c, 2 d-f, 3.—Ohshima, Albatross Holothurians (m.s.).

Within the limits of the Japanese Empire, the species was obtained from the "Albatross" stations off the coasts of Southern Saghalien and of Hokkaidō.

15. *Polycheira rufescens* (Brandt).

Chirodota rufescens Brandt, Prodr. descr. anim. ab H. Mertensis obs., 1835, p. 59.

Chiridota variabilis Semper, Holothurien, 1867-'68, p. 20; pl. V, figs. 6, 7, 9, 11, 19; pl. VI, fig. II.—Augustin, Japanische Seewalzen, 1908, p. 39.

Polycheira rufescens Clark, The Apodous Holothurians, 1907, pp. 120-121; pl. VII, figs. 14-18.—Ohshima, Synaptiden von Misaki, 1913, pp. 258-259; pl. VI, fig. 9.

The species has been known from Bonin Islands (Brandt) and

from Nagasaki (Augustin). I have examined numerous specimens obtained at the following localities :

Two specimens. Kōshun, Akō-Chō, near the south end of Formosa. Watasé, Hozawa, etc. coll. June 9, 1911. (Cat. no. 1864).

Two specimens. Sakibaru, Napha (dead coral reef), Okinawa, Liu-Kiu Islands. Mitsukuri coll. Apr. 7, 1901. (Cat. no. 1767).

One specimen. Tomari-Mura, Napha, Okinawa, Liu-Kiu Islands. Miyajima coll. May 23, 1900. (Cat. no. 1768).

One specimen. Off Itoman (Okaha reef, dead coral reef), Okinawa, Liu-Kiu Islands. Mitsukuri, Ikeda, etc. coll. Apr. 11, 1901. (Cat. no. 1771).

One specimen. ? Koniya-Mura (shore), Amami Ōshima, south of Kyūshū. Tamura coll. Mar. 28, 1900. (Cat. no. 1857 a).

One specimen. Katsuyoshi-Mura, Kageroma Island, Amami Ōshima, south of Kyūshū. Mitsukuri, Ikeda, etc. coll. Apr. 1, 1901. (Cat. no. 1773).

One specimen. Kurokami-Mura, Sakura Jima, Kagoshima Bay, Kyūshū. Azuma coll. (Cat. no. 1123).

Many specimens. Teuchi-Mura, Shimo-Koshiki Island, Kagoshima Prefecture, Kyūshū. Miyajima coll. Jul. 11, 1900. (Cat. no. 1778).

Several specimens. Shimo-Kataura, Kagoshima Prefecture, Kyūshū. Miyajima coll. Jul. 27, 1900. (Cat. no. 1776).

Three specimens. Akuné, Kagoshima Prefecture, Kyūshū. Mitsukuri and Hara coll. Apr. 19, 1896. (Cat. no. 1108).

One specimen. Shimabira (shore), Kagoshima Prefecture, Kyūshū. Mitsukuri and Hara coll. Apr. 18, 1896. (Cat. no. 1107).

One specimen. Ōtomari, Shimo-Sata-Mura, Kagoshima Prefecture, Kyūshū. Azuma coll. (Cat. no. 1777).

Many specimens. Hosojima Bay (under stones), Miyazaki Prefecture, Kyūshū. Terasaki coll. Mar. 15, 1899. (Cat. no. 1112).

Many specimens. Natsui (shore), Ariaké Bay, Miyazaki Prefecture, Kyūshū. Mitsukuri and Hara coll. Apr. 13, 1896. (Cat. no. 1106).

Several specimens. Kashiwa Jima, west of Shikoku. Tago coll. Mar. 22, 1905. (Cat. no. 1784).

Many specimens. Province Tosa, Shikoku. Tago coll. 1905. (Cat. no. 1782).

Many specimens. Tsuru-Mura, Province Tosa, Shikoku. Tago coll. Feb. 18, 1905. (Cat. no. 1671).

Several specimens. Futami Harbor, Chichi Jima, Bonin Islands. Hirota and Sekiguchi coll. Feb.-Mar., 1894. (Cat. no. 1109).

Many specimens. Hachijō Island. (Cat. no. 1110).

Many specimens. South coast of Kōzu Island. Aoki coll. May 9, 1901. (Cat. no. 1797).

Several specimens. Kōzu Island. Aoki coll. May 9, 1901. (Cat. no. 1798).

Many specimens. Mito and Awa Shima, off Enoura, Suruga Bay. Matsumoto coll. Feb. 12, 1911. (Cat. no. 1760).

Many specimens. Enoura, Suruga Bay. Apr., 1884. (Cat. no. 1105).

One specimen. Moroiso, Misaki. Izuka coll., Aug. 15, 1896. (Cat. no. 1807).

One specimen. Koajiro, Misaki. Aoki coll. Dec. 31, 1900. (Cat. no. 1113).

The largest specimen measures 150 mm. in length.

16. *Tæniogyrus cidaridis* Ohshima.

Tæniogyrus cidaridis Ohshima, Albatross Holothurians (m.s.).

Besides the specimens collected by the "Albatross" off the Gotō Islands, I have examined several others from the following localities:

One specimen. South-west of Jōga Shima, Sagami Sea. 70 *hiro* (=ca. 55 fathoms). Ikeda coll. (Cat. no. 1800).

Seventeen specimens. North side Uruga Channel, Mouth of Tōkyō Bay (Amezaki in line with Takeyama). 150 *hiro* (=ca. 120 fathoms). Mitsukuri and Aoki coll. Aug. 27, 1903. (Cat. no. 1811).

Eight specimens. Off Misaki, Sagami Sea (Bishamon-gaké-Kimura ippai). 80 *hiro* (=ca. 60 fathoms). Matsumoto and Chiba coll. Jul. 21, 1913. (Cat. no. 1844).

The largest specimen measures 36 mm. by 3.5 mm.

Dendy and Hindle's statement¹⁾ that the sigmoid hooks in *Chirodota geminifera* are present constantly in pairs, was probably founded on observations on specimens with half-dissolved deposits. In a specimen of the present species (no. 1800), I have observed a similar phenomenon in that every hook was longitudinally split by the action of acidiferous alcohol.

17. *Trochodota dunedinensis* (Parker).

Chirodota dunedinensis Parker, On a New Holothurian, 1881, p. 418.—Dendy, The Holothurians of New Zealand, 1897, pp. 26–28; pl. III, figs. 1–8.

Trochodota dunedinensis Ludwig, Holothurien d. Hamburg. Magalh. Sammelr., 1898, pp. 87–88.—Clark, The Apodous Holothurians, 1907, p. 124.

One specimen. Off Misaki, Sagami Sea (Bishamon-gaké-Kimura ippai). 80 *hiro* (=ca. 60 fathoms). Matsumoto and Chiba coll. Jul. 21, 1913. (Cat. no. 1846).

Length 30 mm., diameter 3 mm. Color white. Tentacles ten, each with four pairs of digits. Wheels confined to the three dorsal interradii and thinly scattered; diameter 75–130 μ . Sigmoid hooks 95–130 μ long. In tentacles delicate rods are profusely found; they are 45–70 μ long, shaped like an elongated C, and are provided with 6–10 short processes along the convex side. Ciliated funnels not found. Genital tube undivided, one on each side.

The specimen differs from the New Zealand form in that the wheels are much smaller and the genital tube is not divided. The

1) Jour. Linn. Soc. London (Zool.), vol. XXX, no. 196, 1907, p. 113; pl. XIV, figs. 30 b, c.

dark spots observed by Parker inside the base of tentacles could not be made out. None of the previous writers on New Zealand specimens seem to have observed the deposits in tentacles. It may be that the Japanese specimens represent a distinct species.

18. *Trochodota rosea*, sp. nov.

Two specimens. Down off Nami-no-Uyê Temple (dead coral reef), Napha, Okinawa, Liu-Kiu Islands. Mitsukuri coll. Apr. 8, 1901. (Cat. no. 1770).

Length 30 mm., diameter 4 mm. Color in life pink. Tentacles ten, each with three pairs of digits, which increase in length towards the distal end. Wheels numerous, distributed all over the body, in some parts so clustered as to overlap one another, but nowhere forming wheel-papillæ. They vary $37-105\ \mu$ in diameter. Sigmoid hooks of the ordinary shape, generally $90\ \mu$ long though in some few individuals the length ranged $80-95\ \mu$. In the tentacles are found bent rods of a shape exactly the same as in those of *T. purpurea* (Lesson)¹⁾, measuring $50-100\ \mu$ in length. Segment of calcareous ring 1 mm. by 0.4 mm., narrowed in the middle. Polian vesicle one, stone-canal not made out. Ciliated funnels in a thick zone along middorsal and the left dorsal interradii. Genital tubes not divided.

The present species is very close to *T. purpurea*, the only important difference from that species consisting in the much smaller size of sigmoid hooks.

19. *Scoliodota japonica* (v. Marenzeller).

Chirodota japonica v. Marenzeller, Neue Holothurien von Japan und China, 1881. pp. 123-124.

Scoliodota japonica Clark, The Apodous Holothurians, 1907, pp. 30, 125; pl. VII, fig. 5.—Ohshima, Synaptiden von Misaki, 1913, pp. 259-262, textfigs. A-D; pl. VI, figs. 1-3.

1) Ludwig, 1898, pl. III, fig. 43; or Clark, 1907, pl. VII, fig. 7.

To the locality reported by v. Marenzeller, i.e., east side of Eno Shima, Sagami Bay, I may add the following :

Jōga Shima, Misaki. Three specimens. (Cat. no. 1114).

Bishamon (a few fathoms), near Misaki. One specimen. (Cat. no. 1127).

Moroiso, Misaki (*Veretillum* beach). Several specimens. Mitsu-kuri coll. Aug. 12, 1897. (Cat. no. 1128).

The largest specimen is 55 mm. long and 8 mm. broad. Sigmoid hooks measure $63-120\mu$ in length, exceptionally only 47μ in the anterior region of body. The hooks gather together into the characteristic conical "hook-papillæ," each of which may contain them numbering up to sixteen. In the anterior region of body a papilla contains only two hooks, or even one only. The wheels are extremely infrequent, though near the base of tentacles they can be found without much difficulty.

Clark presented his *Scoliodota* as being characterized by the presence of ten tentacles and of hook-papillæ, and by the absence of wheels. The discovery of wheels, extremely rare though these be, and the presence of tentacles in the same number have reduced the differences of the present species from *Trochodota* to the one point that the former is in possession of hook-papillæ, which are wanting in the latter. Now, in view of the fact that in *Tæniogyrus australianus* the presence of hook-papillæ is not regarded as giving to that species a distinct generic status, the tenability of Clark's genus *Scoliodota* becomes doubtful. I should not wonder if it would turn out to be inseparable from *Trochodota*.

20. *Toxodora pacifica* Ohshima.

Toxodora pacifica Ohshima, Albatross Holothurians (m.s.).

The species is based on a series of specimens secured by the "Albatross" in Suruga Bay (Station 5073).

The character of the genus, very meagrely described by the

founder, has been obscure untill Clark placed it on a firm basis by revision of the original specimens. The discovery of the present species should serve as a further support for the validity of this singular genus.

Subfamily III. MYRIOTROCHINÆ.

21. *Myriotrochus rinkii* Steenstrup.

Myriotrochus rinkii Steenstrup, Videnskab. Medl. fr. d. naturh. For., 1851, pp. 55-60; pl. III, figs. 7-10.—Östergren, The Holothurioida of Northern Norway, 1902, pp. 14-18.—Clark, The Apodous Holothurians, 1907, pp. 30-31, 128; pl. VIII, figs. 21-22.—Ohshima, Albatross Holothurians (m.s.).

In the North Pacific this species has been reported from the Bering Strait region, Pribilof Islands and Kamchatka.

In the Science College Museum there is a specimen of *Myriotrochus*, which I may refer to the present species though with much hesitation. It hails from 170 *hiro* (=ca. 130 fathoms) in Naka-no-Yodomi, Sagami Sea, having been captured by the late Prof. Mitsukuri and Aoki (Cat. no. 1855). The specimen lacks the anterior part and measures only 12 mm. by 3 mm. The wheels are absent on ventrum; they measure 175-240 μ , on an average 214 μ , in diameter; number of spokes 14-19, on an average 14.5; peripheral teeth number 23-30, on an average 25.6. I have come across only two cases of exceptionally small wheels, measuring 80 μ and 150 μ respectively, but such small wheels do not seem to constitute a distinct class by themselves, as they do in *M. minutus* Östergren. Ratio of the number of spokes to that of peripheral teeth ranges from 56.7 to 74%, with a mean of 65%. In Kamchatka specimens I have found the ratio to vary from 60 to 100%, with a mean of 79%. This seems to stand in accord with the result arrived at by Östergren and Clark, that the number of spokes tends to decrease in specimens from

more southern regions. Noteworthy is the fact that such an arctic form occurs in Sagami Sea (lat. 35° N.).

22. *Myriotrochus minutus* Östergren.

Myriotrochus minutus Östergren, Zwei koreanische Holothurien, 1905, pp. 194-196, fig. 1A.—Clark, The Apodous Holothurians, 1907, p. 129.

Since the original specimen of this species was obtained off the coast of Korea, no second specimen seems to have been captured.

23. *Myriotrochus mitsukurii* Ohshima.

Myriotrochus mitsukurii Ohshima, Albatross Holothurians (m.s.).

This interesting species, bearing some relationship to *Acanthotrochus*, is known only from off the west coast of Hokkaidō.

Zoological Institute, Science College.

March 1st, 1914.

Note on a New Termitophilous Coleoptera found in Formosa (*Ziaelas formosanus*).

By

Sanji Hozawa, *Rigakushi*.

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With Plate VI.

Among the specimens of termitophilous insects collected by me during my studies on the Termites of Japan and Formosa, I have found a curious beetle which is apparently a very close ally of *Ziaelas insolitus* Fairmaire, but seems to be distinguishable from this species in some respects. I propose to call it *Ziaelas formosanus*.

The genus *Ziaelas* was established by Fairmaire¹⁾ in 1892 as a new Tenebrionid genus, with the single species *Z. insolitus*. The genus and species were based on specimens obtained by M. A. Sallé at Hué, Annam. Subsequently the species was placed by Wasmann²⁾ under his new family, the Rhysopausidae,³⁾ which constitutes a remarkable group of termitophilous Coleoptera. The species is also found included in the lists of the Rhysopausidae, in the papers of Gestro,⁴⁾

1) Fairmaire, L.; *Ziaelas* n. g. *insolitus* n. sp. Ann. Soc. Entom. France, LXI, 1892. Bull., pp. CX-CXI.

2) Wasmann, E.; Neue Termitophilen und Termiten aus Indien. IV (Nachtrag). Ann. Mus. Civ. Genova, (2) XVII (XXXVII), 1896-97, pp. 149-152, fig. 1, a, b.

3) The family Rhysopausidae Wasmann [Ann. Mus. Civ. Genova, (2) XVI (XXXVI), 1896, p. 613] has been adopted by Fea [Ann. Mus. Civ. Genova, (2) XVII (XXXVII), 1896-97, p. 585], Gestro [Ann. Mus. Civ. Genova, (2) XX (XL), 1899, p. 743], [Ann. Mus. Civ. Genova, (3) V (XLV), 1911, p. 5], Fairmaire [Bull. Soc. Entom. France, 1900, No. 3, p. 45], Escherich [Die Termiten. Leipzig, 1909, p. 137], etc. Recently the group was treated of as a subfamily of the Tenebrionidae by Wasmann [Zeitschr. f. Wiss. Zool., Bd. 101, 1912, pp. 70, 82-84.]

4) Gestro, R.; Un nuovo genere di Rhysopausidae. Ann. Mus. Civ. Genova, (2) XX (XL), 1899, p. 748.

Wasmann,¹⁾ etc. However, since it was first described by Fairmaire, no second record of its occurrence, nor the discovery of a form allied to it, seems to have been made in any part of the world. Unfortunately Fairmaire's description of the beetle is very brief and unsatisfactory. Nothing whatever about its ethology is mentioned. On the ground of Wasmann's studies, it is to be assumed that the species is probably a termitophilous insect.

As to the present species, *Z. formosanus*, three specimens were collected in 1911 by Prof. Watasé and myself at Kuraru, Ako District, Formosa. They were taken from the nest of *Odontotermes* (*Cyclotermes*) *formosanus*. The nest of this termite is situated about four feet below the surface of the ground and consists of a royal cell and many other cells containing each a round spongy fungus-bed.

From some cells of the latter kind, I have obtained three specimens of the beetle in question, together with numerous larvae of the termite. In organization the beetle shows several peculiar points which seemed to be the result of its life in the nest of the termite, as for instance the elongated eyes and degenerated hindwings. The insect was capable of but very sluggish movements.

Here I let follow a description of the species.

Ziaelas formosanus, n. sp.

Colour.—Dorsal surface dark reddish-brown and ventral surface somewhat lighter, as observed on specimens preserved in alcohol.

Head.—More or less longer than broad, divided by a constriction before the eyes into an anterior and a posterior part. Anterior part narrower than the posterior, subquadrate, with a short projection in front, the antero-lateral corner forming a large conspicuous tubercle, underneath which the antenna arises. On the forehead between the

1) Wasmann, E.; Termitophilen aus dem Sudan. Results of the swedish Zoological Expedition to Egypt and the White Nile 1901 under the Direction of L.A. Jägerskiöld. No. 13, 1903, p. 6.

tubercles there runs a narrow longitudinal groove downwards. Posterior part of head also subquadrate, with slightly rounded lateral edges and slightly concave posterior margin (figs. 2, 3).

Antenna.—Rather long, longer than head and pronotum combined, submoniliform, 11-jointed; 1st joint very large, subcylindrical, nearly $1\frac{1}{2}$ times as long as broad, narrow at base and broadening distally; 2nd joint the smallest of all, orbiculate; 3rd and 4th joints similar, about as long as broad; 5th-9th joints increasing slightly and gradually in breadth and assuming a more and more turbinate form in the more distally situated ones; 10th joint somewhat narrower than the preceding one; 11th joint equal to the last in breadth, with slightly obliquely truncated tip bearing fine spiny hairs on the surface (fig. 4).

Labrum.—Slightly arched, a little broader than long, subquadrate, slightly sinuate in front, obtusely rounded in the antero-lateral corners and straight on the sides. The margin bears short hairs, of which those on antero-lateral corners are on the whole the longest (fig. 5).

Eyes.—Distinctly separated from one another, very narrow, not projecting, black in colour, finely punctured as in other parts of the head but not faceted; so far as can be seen on the upper side of head, each eye presents a transversely elongate reniform shape, being broadly emarginated in front. Seen on the sides of head it is narrower, shows slight backward curvature near inferior end (figs. 2, 3).

Mandibles.—Equal, strong, three-sided, a little longer than broad, reddish brown in colour except the acute incurved tip which is black, upper side slightly convex, outer side concave, lower side much more concave. Inner margin of mandible almost straight with a small notch-like concavity in the middle; outer margin much convex. At inner base there exists a subquadrate tooth-like process with finely serrate inner edge (figs. 6, 7).

Pronotum.—Much broader than head, nearly so long as broad, with anterior margin almost straight, antero-lateral margins broadly rounded, postero-lateral margins slightly converging posteriorly, and

posterior margin slightly sinuate. Dorsal surface of pronotum slightly arched, finely punctured, with three pairs of longitudinal ridges, viz., a median pair formed of the longest ridges and two more pairs formed of antero-lateral and postero-lateral ridges on both sides of the median pair (fig. 8).

Prosternum.—With a moderately broad median ridge, anterior margin concave, posterior margin also concave but with a short pointed process in the middle (fig. 9).

Elytra.—The elytra in situ (fig. 1), about $2\frac{1}{4}$ times as long as broad, distinctly broader than pronotum; base gently arcuate and notched in the middle; lateral edges quite or nearly parallel in basal $\frac{2}{3}$ of their length and then gently curving towards each other before they meet at the apex, giving to this part of the elytra an inverted dome-like outline and showing in this part only an obscure constriction-like depression of surface. Costa numbers ten on each side (fig. 11). The 1st costa forming the inner margin of each elytron is long; the 2nd also long, almost reaching to apex of elytron; the 3rd shorter than the 2nd but longer than the 4th, which is the shortest of all; the 5th longer than the 6th but shorter than the 7th, which is nearly as long as the 2nd; the 9th shorter than the 8th; the 10th long and forming the outer margin of elytron. Each inter-costal area is beset with a row of minute quadrate punctures with rounded corners.

Abdomen.—Dorsal integument soft, not so strongly chitinized as the ventral integument, brownish yellow in colour. Ventral surface rather flat, showing five segments, of which the 4th is the shortest (fig. 10).

Legs.—Compressed. First and second legs are of about the same length and structure; tibia shorter and narrower than femur, with very fine lateral and three large terminal spines; tarsus short, thick, diminishing in thickness towards the extremity, 5-jointed; the proximal four joints short; the 5th joint nearly as long as the preceding two joints combined, with two incurved claws (figs. 12, 13). Third leg much longer than the first or the second; tibia with two terminal

spines; tarsus 4-jointed; the 1st joint longer than the 2nd or the 3rd, but shorter than the 4th which is equal in length to the 2nd and 3rd combined. The third leg exceeds the end of abdomen when stretched out posteriorly (fig. 14).

Sexual organs.—All the three specimens on hand are of the same appearance and structure. They are probably all males, as one of them proved to be on examination after laying out into sections. The internal male organ consists of testes, seminal ducts, seminal vesicles, accessory glands and ejaculatory duct. Of these parts, the seminal vesicles are the most conspicuous, being very voluminous convoluted tubes, occupying the greater part of the interior of abdomen. They are filled with filiform spermatozoa.

Measurements.—One of the specimens gave following measurements :

Length of body	8.0	m.m.
Length of head	1.1	„
Breadth of head	1.03	„
Length of antenna	3.0	„
Length of labrum	0.37	„
Breadth of labrum	0.57	„
Length of pronotum	1.6	„
Breadth of pronotum	1.6	„
Length of elytra	5.5	„
Breadth of elytra	2.5	„

The two other specimens measured respectively 8 mm and 7.5 mm in body length.

Remarks.—In external characters, the present species agrees closely with the figure given by Wasmann (l.c.) of *Ziaelas insolitus*, but may be distinguished from this by the more fully rounded shape of the hind end of elytra, instead of this part being marked off from the more anterior parts by gentle constriction at sides. The 4th costa of elytron is shorter than any of the rest, but not so prominent as in the genus *Azarelius* Fairmaire.

Explanation of Plate VI.

- Fig. 1. Dorsal view. $\times 6$.
Fig. 2. Dorsal view of head. $\times 20$.
Fig. 3. Side view of head. $\times 20$.
Fig. 4. Left antenna. $\times 30$.
Fig. 5. Labrum. $\times 50$.
Fig. 6. Right mandible. $\times 50$.
Fig. 7. Left mandible. $\times 50$.
Fig. 8. Pronotum. $\times 20$.
Fig. 9. Prosternum. $\times 20$.
Fig. 10. Ventral view of mesothorax, metathorax and abdomen. $\times 20$.
Fig. 11. Right elytron. $\times 20$.
Fig. 12. First right leg. $\times 20$.
Fig. 13. Second right leg. $\times 20$.
Fig. 14. Third right leg. $\times 20$.
-

On the Osmylinae of Japan.

By

Waro Nakahara.

In order to supplement in a way the works of MacLachlan,¹⁾ and Navás²⁾ on the Osmylinæ of this part of the world, it is proposed to give in this paper an account of all the forms of that subfamily known to me from Japan (not including Formosa). Though the material which came under my examination cannot be said to be extensive, I have thus far been able to recognize fourteen species as occurring in the region referred to. Of that number, seven seem to be new to science and one to be new to Japan, while the remaining six represent all those species which have hitherto been recorded from that country. Here I let follow the list:

FAMILY HEMEROBIIDAE.

Subfamily Osmylinæ.

Tribe Sisyriini.

1. *Sisyra japonica* n. sp.
2. *S. ozenumana* n. sp.
3. *Sisyra Yamamuræ* n. sp.

Tribe Berothini.

4. *Berotha (Isoscelipteron) Okamotonis* n. sp.

Tribe Osmylini.

5. *Spilosmylus tuberculatus* (Walker).
6. *S. nikkoënsis* (Navás).
7. *Spilosmylus flavicornis* (MacLachlan).
8. *S. immaculatus* n. sp.

1) A Sketch of our present knowledge of the neuropterous fauna of Japan (excluding Odonata and Trichoptera). Trans. Ent. Soc. Lond., Pt. ii (1875).

2) Osmylides exotiques nouveaux. Ann. Soc. Scient. Bruxelles (1910).

— Névroptères nouveaux de l'extrême Orient. Rev. Russ. d'Entom., xi (1911).

9. *Spilosmylus Harmandinus* (Navás). 12. *Osmylus Pryeri* Mac-Lachlan.
 10. *S. nigricornis* n. sp. 13. *O. decoratus* n. sp.
 11. *Osmylus tessellatus* Mac-Lachlan. 14. *O. hyalinatus* Mac-Lachlan.

It is an interesting fact that the Indian species, *Spilosmylus tuberculatus*, lately found in Formosa by Petersen,¹⁾ occurs also in Japan. *Osmylus hyalinatus*, common in Hokkaido and occurring also in Hondo and Shikoku, has recently been recorded from Siberia by Navás,²⁾ so that this species may be said to have a rather wide range of distribution in the northern part of eastern Asia. The following table shows the geographical distribution, as far as can be ascertained, of all the species listed above.

	Siberia.	Saghalien.	Japan.				Formosa.	Philippine.	Assam.	Burma.	Java.
			Hokkaido.	Hondo.	Shikoku.	Kiushiu.					
<i>Sisyra japonica.</i>				*							
<i>S. ozenumana.</i>				*							
<i>S. Yamamuræ.</i>				*							
<i>Berotha (Isoscelipteron) Okamotois.</i>				*							
<i>Spilosmylus tuberculatus.</i>				*			*	*	*	*	*
<i>S. nikkoënsis.</i>			* ?	*		*	* ?				
<i>S. flavicornis.</i>			*	*	*	*					
<i>S. immaculatus.</i>				*							
<i>S. Harmandinus.</i>		* ?	*	* ?		* ?					
<i>S. nigricornis.</i>				*							
<i>Osmylus tessellatus.</i>				*		*					
<i>O. Pryeri.</i>				*							
<i>O. decoratus.</i>				*		*					
<i>O. hyalinatus.</i>	*		*	*	*						

1) "Sauter's Formosa Ausbeute. Neuroptera Planipennia II, Megaloptera and Mecoptera. Ent. Mitt., ii (1913).

2) Quelques Névroptères de la Sibérie méridionale-orientale. Rev. Russ. d'Entom., xii (1912).

FAMILY HEMEROBIIDÆ.

Subfamily Osmylinæ.

Certain authors have separated from the Hemerobiidæ such genera as *Osmylus*, *Dilar*, etc., as representing distinct families, but I agree with Banks¹⁾ in thinking that it would be more natural to keep up this family in the broad sense, dividing it into four subfamilies as follows: 1) The Dilarinæ, characterized by the peculiar ovipositor of the female and the pectinate antennæ of the male. 2) The Psychopsinæ, characterized by the union of subcosta, radius and radial sector. 3) The Osmylinæ, in which the subcosta and radius are united near tip of wing. 4) The Hemerobiinæ, to include all the rest of the family.

Of these subfamilies, the Dilarinæ seems to be well differentiated from all the others on account of the male antennæ being of a structure somewhat resembling that in the Sialidæ, and of the ovipositor resembling that of the Rhaphididæ. The remaining three subfamilies are very nearly allied with one another; especially close seems to be the relation between the Osmylinæ and the Hemerobiinæ, and it may even become necessary in the future to unite these two subfamilies into one. Here I should mention that the fact of the union of the subcosta and radius, taken alone by itself, does not seem to be always sufficiently adequate to serve as distinctive criterion between the Osmylinæ and the Hemerobiinæ; for, in a new Japanese Osmyline form (*Sisyra japonica* n. sp.) I have found the union of the said veins only imperfectly carried out. Further, it may be pointed out that *Sisyrella nikkoana* (Navás), a form generally placed under the Hemerobiinæ,²⁾ so closely approaches *Sisyra* in several respects that it may

1) Synopses and Descriptions of Exotic Neuroptera. Trans. Amer. Ent. Soc., xxxix (1913).

2) Navás, Hémérobides nouveaux du Japon. Rev. Russ. d'Ent., No. 4, p. 397-98 (1910), —Banks, l.c., p. 218.

be said to stand almost on the verge of being an intermediate form between the two subfamilies. In this regard, both *Sisyrja japonica* and *Sisyrrella nikkoana* are of much interest, and more knowledge about them than we have at present is exceedingly desirable.

Krüger, in his recent work on Osmylidæ¹⁾, has presented a new classification of the family, dividing this into two divisions and six subfamilies, mainly on the basis of venational characters. From the point of view that in this group of insects the details of wing-venation, such as are utilized by Krüger, are something much subject to individual variation and therefore can not be solely depended upon for the systematic purpose, it seems to me that Banks' system before mentioned is the more natural and the more acceptable in the present state of our knowledge.

Tribe **Sisyrini** Banks.

Trans. Amer. Ent. Soc., xxxix, p. 211 (1913).

This tribe includes two genera which can be distinguished as follows:—

- { Radial sector with three branches before stigma *Sisyrja*.
- { Radial sector with one branch before stigma *Climacia*.

Genus *Climacia* is, so far as known, not represented in Japan.

Genus **Sisyrja** Burm.

Sisyrja Burmeister, Handb. Entom., ii, p. 975 (1839); Walker (*Hemerobius*, part) Cat. Neuropt. Brit. Mus., ii, p. 296 (1853); Needham, N.Y.S. Mus., Bull. 86, p. 16 (1905); Banks, Proc. Ent. Soc. Wash., xi, p. 76 (1909); Banks, Trans. Amer. Ent. Soc., xxxix, p. 211 (1913).

It may be said that there exist sufficient differences between this

1) Beitrag zu einer Monographie der Neuropteren-Familie der Osmyliden. Stett. Ent. Zeit., 73 Jg. und 74 Jg. (1912-13).

genus and *Climacia* to base generic distinction upon. In *Sisyr*a the number of branches from radial sector is constantly well fixed; moreover, it never shows an outer gradate vein, while *Climacia* always has this in some number. Hitherto no *Sisyr*a has been recorded from Japan, but I have discovered in Hondo three species, all which seem to be new to science. They may be distinguished as follows:—

1. Anterior margin of hind stigmatic region markedly produced; two of the costal cross-veins separated from the others in forewing; subcosta and radius rather imperfectly united....

..... *S. japonica*.

- Anterior margin of hind stigmatic region not produced; none or only one of the costal cross-veins separated in forewing; subcosta and radius perfectly united2.

2. Subcosta of forewing darkish; median and cubital veins not connected; head black.....*S. ozenumana*.

- Subcosta pale; median and cubital veins connected by a cross-vein; head brown*S. Yamamuraæ*.

*Sisyr*a *japonica* n. sp. Fig. 1.

Head fuscous black, much swollen above; upper part of face black, lower half including mouth-parts pale yellow; palpi pale, the last joint of maxillary palpi very long and spindle-shaped, that of labial palpi nearly triangular in shape with numerous fine hairs on top and sides; antennæ black at base, terminal half ochraceous yellow.

Prothorax pale yellow, fuscous yellow above, the anterior margin a little produced and spotted with fuscous. Meso- and metathorax also fuscous yellow, each segment suffused with brown at margin, scutella yellowish.

Legs uniformly pale, densely haired, only the last tarsal joint and claw brownish or testaceous.

Abdomen uniformly pale yellow, with a bushy bundle of pale

hairs on each segment; on the ventral side, the hair bundles consist of more numerous hairs; the last three segments much slender than the others; paired lateral appendage of male not long, pointed, fuscous at tip; a large ventral appendage directed upwards, its tip covered with fine hairs; suranal plate much more hairy.

Wings nearly uniform light brown, somewhat darker at costal and apical areas; veins entirely pale.

Forewing with costal cross-veins less than ten in number; none of them separated from others, nor connected with one another by cross-vein; three cross-veins between radius and its sector; a cross-vein between the sector and the hindmost branch of it; veins in stigmatic region undeveloped; subcosta terminally quite imperfect;

median forks not connected with cubital.

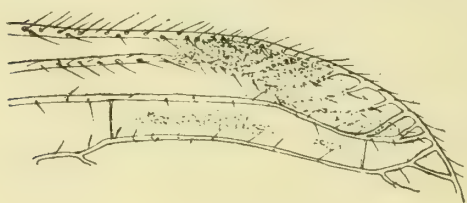


Fig. 1.

Sisyra japonica n. sp.

Pterostigmatic region of fore-wing. 40 ×.

Hind-wing rather wide in the pterostigmatic region, produced and rounded; with six costal cross-veins at base, the innermost cross-vein a little separated from the rest; median and cubital forks connected by a cross-vein.

Measurements:

Length of body	3.5 mm.
„ „ antennæ	3 „
„ „ forewing	4.5 „
Width of „	2.5 „
Length of hindwing	4 „

A single male specimen in my collection. It was captured by my friend, Mr. T. Esaki, in his garden in Osaka, middle of August 1913.

Sisya ozenumana n. sp.

Head black, swollen above; face fuscous black; mouth-parts ochraceous; antennæ deep black, more or less fuscous beyond the middle, a few terminal joints blackish.

Prothorax fuscous, covered with fine hairs; meso- and metathorax ochraceous fuscous, especially so on the back, somewhat paler below; mesothorax much swollen above.

Legs pale yellow; foreleg slightly spotted with darkish; terminal joint of tarsi darker in all the legs.

Abdomen brown; terminal segments lost.

Wings hyaline and uniformly light brown; veins mostly pale, subcosta suffused with light fuscous, other principal veins somewhat dark towards base.

Forewing with 8 costal cross-veins, of which the last one is widely separated from the others: radial sector with 3 branches and connected with radius at three points; a very faint cross-vein between the 1st branch and base of the 2nd branch of the sector; media dichotomously forked three times, the anterior fork with one branch more than the posterior fork; length of cubito-anal cell equals nearly three times the width.

Hindwing with about seven costal cross-veins, all in the basal parts.

Measurements:

Length of body	?
„ „ antennæ	3 mm.
„ „ forewing	5 „
Width of „	2.4 „
Length of hindwing	4 „

A single specimen (sex undeterminable) obtained by the author on the shore of Lake Oze, Prov. Kōzuke, Aug. 1, 1913.

Sisyra Yamamurae n. sp.

Head ochraceous yellow, covered with yellowish hairs; face yellowish; last joint of maxillary palpi thick and extremely long; antennæ with about 50 joints, black, some terminal joints pale yellow; vertex spotted with fuscous.

Prothorax ochraceous yellow with fuscous spots and yellowish hairs; much wider than long.

Legs pale, with tibia darkened at extremity.

Abdomen much thickened at apex, darkish yellow; on both dorsal and ventral sides, most segments show on the hind margin a black spot covered with long hairs. Paired lateral appendage of male rather large, sending out a pair of long and very slender, upwardly directed, claw-like processes; the slender processes just mentioned not longer than the basal part from which they arise, not crossing each other at their ends.

Wings hyaline, nearly colorless, with yellowish neuration; costal cross-veins rather unequally distributed, nine of them in the basal half and only one in the distal half of the space between base and stigma; media is dichotomously forked three times in forewing, and twice in hindwing.

Hindwing nearly perfectly colorless, excepting anterior marginal area and pterostigma which are yellowish.

Measurements:

Length of body	4.5 mm.
„ „ antennæ	4 „
„ „ forewing	6 „
Width of „	3 „
Length of hindwing	4 „

A single male specimen captured by my friend, Mr. S. Yamamura, in the garden of the Prefectural Agricultural Experiment Station of Shiga (Prov. Ohmi) on May 27th, 1912.

Remark: This species closely resembles *S. Indica*, which Needham¹⁾ described from India, but differs from it distinctly in the structure of the male genital appendage.

Tribe **Berothini** Banks.

Trans. Amer. Ent. Soc., xxxix, p. 211 (1913).

Under this tribe Banks has placed three genera, viz., *Lomamyia*, *Isoscelipteron* and *Berotha*.

Genus **Berotha** Walker.

Berotha Walker, Trans. Ent. Soc. Lond., v. N.S., pt. v, p. 186 (1860); Needham, N.Y.S. Mus., Bull. 86, p. 16 (1905); Banks, Trans. Amer. Ent. Soc., xxxix, p. 212 (1913).

This genus differs from *Lomamyia* in the radial sector being not connected with media.

Banks separated *Isoscelipteron* from *Berotha* on account of the former having eight, instead of four or five, branches to radial sector; however, since some species, as f.i. *Berotha rufa* and *B. nicobarica* described by Navás,²⁾ show seven branches, and since moreover the number of the branches is subject to variation among individuals of one and the same species, I will not give *Isoscelipteron* more than subgeneric status unless stronger grounds for its generic separation be forthcoming.

Subgenus **Isoscelipteron** Costa.

Isoscelipteron Costa, Fauna del Regno di Napoli³⁾ (1860-70); Banks, Trans. Amer. Ent. Soc., xxxix, p. 212 (1913).

1) Notes on the Neuroptera in the collection of the Indian Museum. Rec. Ind. Mus., iii, pt. iii, No. 12, p. 206-07, pl. xxi, fig. i (1909).

2) Crisópidos y Hemeróbidos (Ins. Neur.) nuevos ó críticos. Brotéria, x, Serie Zoologica, fasc. ii, p. 108-09 (1912).

3) This work was unfortunately not accessible to me.

Berotha (Isoscelipteron) Okamotonis n. sp.

Head yellow, face and mouth-parts somewhat darker; antennæ yellow, basal joint much elongated and covered with yellowish hairs, other joints brown in their terminal half, thus giving the antennæ an annulated appearance; compound eye black.

Prothorax yellow, with a lyre-shaped impression in the middle, and also two obscure transverse grooves above; broadly dark brown on both sides, which are covered with very long hairs of that color. Meso- and metathorax fuscous yellow, covered with hairs.

Abdomen fuscous, pale on ventral side and at apex; in the male, the apex with two very long and slender, inferiorly directed appendages which are covered with very long hairs.

Legs pale, covered with long hairs; anterior tibia and femora spotted with fuscous.

Forewing hyaline, with pale neuration; all veins except subcosta minutely spotted with fuscous; margin of the wing, but especially the basal parts of inner marginal and apical areas, faintly marked with brown; cross-veins fuscous black and margined with fuscous; along inner margin of the wing, several distinct blackish spots caused by the branching and black-marked ends of anal and cubital veins; pterostigma blood-red.

Costal area with about 20 cross-veins; all the cross-veins, excepting those at base of the area, with two or three branches; three cross-veins between radius and radial sector; the sector with 8 or 9 branches.

Hindwing also hyaline; principal veins pale yellow; cross-veins, especially those of the gradate series, fuscous black; pterostigma reddish yellow; hind margin with long hairs in basal parts only; with 6 veins in the gradate series.

Measurements :

Length of body..... 10 mm.

„ „ antennæ 8 „

Length of forewing 13 mm.

„ „ hindwing 11.5 „

A single female(?) specimen captured on Mt. Iwawaki, Prov. Kii, Aug. 17th, 1911, by Mr. Isshiki, is in the collection of Mr. H. Okamoto. Further, a male specimen, captured by Mr. A. Nohira at Minomo near Osaka, is in my collection.

Remark: This species closely resembles *Berotha (Isoscelipteron) puncticollis*, which was described by Navás¹⁾ from Formosa, but can at once be distinguished from this by the markings on body, especially those on head, prothorax and wing, by wing-venation, etc.

Tribe **Osmylini** Banks, s. emend.

Osmylini Banks, Trans. Amer. Ent. Soc., xxxix, p. 211 (1913).

Nymphini Banks, l.c.

Banks has separated Osmylini and Nymphini as distinct tribes, but I regard this distinction to be too arbitrary for acceptance, inasmuch as there exist between them, so far as I can see, no sufficient difference by which it could be held up. The presence or absence of ocelli, utilized by many other authors for their separation, proves to be of no avail, since there exist under Nymphini forms with ocelli as well as those that are without them. It is therefore obvious that the system of these insects as it now stands, is in much confusion, and hence Osmylini is here put forward provisionally in the sense which covers Nymphini also. Then the tribe may be defined as follows:

Ocelli present or absent; in the latter case there exist tubercles instead. Wings with numerous cross-veins besides those of gradate series; all cross-veins beset with hairs; in forewing media and cubitus have each one branch running parallel to them for a considerable distance in forewing; in hindwing cubital branch not always parallel to cubitus; no recurrent vein at base of forewing.

1) Névroptères nouveaux de l'extrême Orient. Rev. Russ. d'Entom., xi, p. 112, fig. 2 (1911).

In his recent work on the Osmylidæ (l.c.), Krüger has created numerous new genera, many of which are without doubt to be ranged under the Tribe Osmylini as defined above. Whatever be the true status of these genera, they may be considered to be of no concern to the Japanese species known at present of the tribe. The latter I refer to the two old genera, *Osmylus* and *Spilosmylus*, which may be distinguished from each other in the following way:

Cubitus of hindwing with a branch running for most part along with and parallel to it *Osmylus*.

Cubitus of hindwing with a branch, which, instead of running along with it, makes its course obliquely towards inner margin of the wing *Spilosmylus*.

Here a few words about the genital appendage of *Osmylus*. Needham (l.c.) has described from the alleged male of *Parosmylus prominens*, a form later referred to *Osmylus*, a curious appendage depending from the hindmost abdominal segment and tentatively called by him the "sperm conveyor." He said: "This is boat-shaped in outline, with a pair of minute palps on the bilobed posterior end. It appears to be capable of being swung in and out on a more or less flexible and muscular pedicel, and when swung inwards, its point must be close to the sperm orifice."

This interesting organ is present in several specimens examined by me, but contrary to Needham's statements, I have found all those individuals to be females, not males. A living specimen of *Osmylus hyalinatus* with the organ laid eggs in the paper bag in which it was held in captivity. This shows that both Petersen and Banks are right in considering specimens without the organ to be the males.

The male genital apparatus of *Osmylus* is characterized by the presence of a pair of peculiar free sacs. In the male of *Spilosmylus* these are wanting, though the female is in possession of the boat-shaped organ before referred to.

Genus *Spilosmylus* Kolbe.

Spilosmylus Kolbe, Netzflüg. Deutsch-Ostaficas, p. 33 (1897);
Banks, Trans. Amer. Ent. Soc., xxxix, p. 212 and 214
(1913); Krüger, Stett. Ent. Zeit., 74 Jg., p. 52 (1913).

Lysmus Navás, Rev. Russ. d'Ent., xi, p. 112-13 (1911).

Thyridosmylus Krüger, l.c., p. 87.

Ripidosmylus Krüger, l.c., p. 61.

Petersen (l.c.) said that Navás' *Lysmus* might be included in the old genus *Osmylus*, on the ground of the inadequateness of the main character upon which the former was founded; but I think that there exist certain other important characters, which were not noted by Navás in his generic diagnosis but which seem to sufficiently warrant the generic separation of the two. On the other hand, I agree with Banks in considering *Lysmus* to be only a synonym of *Spilosmylus*. Further, I may say that many of Krüger's genera placed under his subfamily Spilosmylinæ are very closely allied to *Spilosmylus* and can scarcely be distinguished from this. It seems to me that at least two of his genera, *Thyridosmylus* and *Ripidosmylus*, should be merged into the present genus, which, in my opinion, may be defined as follows:

Ocelli present. Basal joint of tarsi much longer than the next following joint. In forewing, basal part of costal area narrow; costal cross-veins mostly simple; media forked towards base. In hindwing, a row of cells present beyond end of cubitus; the cubitus has a branch bent posteriorly and not running parallel to it.

Synopsis of the species found in Japan:

1. A tubercle on hind margin of forewing *tuberculatus*.
— No tubercle on wing 2.
2. Antennæ fuscous black *nigricornis*.
— Antennæ yellowish 3.
3. With three black spots placed in a triangle on prothorax
..... *flavicornis*.

hind margin, the tubercle measuring only about 1 mm. in diameter and about $\frac{1}{5}$ mm. in height; veins mostly pale but interrupted by blackish; subcosta and radius with strongly pronounced black and pale alternate spaces; pterostigma light brown, with thickened dark brown veins on each side.

All the costal cross-veins simple in my specimens; radial sector with 9-12 branches; cross-veins on the disk very few in number, mostly marked with fuscous.

Hindwing with brown pterostigma; neuration nearly entirely pale whitish, especially in inner marginal area; discal cross-veins mostly fuscous, very small parts of principal veins likewise fuscous.

Measurements:

Length of body	9-11 mm.
„ „ forewing	17-19 „
Width of forewing	6-6.5 „
Length of hindwing	16-17 „

Hab.: A large number of specimens of this species were received by me from the following localities:

Mt. Kinkwa near Gifu, Mr. S. Yamamura coll.

Prov. Harima, Mr. S. Iguchi coll.

Tsuchiura, Prov. Hitachi, Mr. S. Kimura coll.

Kyōto and Yoshino (Prov. Yamato), Mr. A. Nohira coll.

Alikang, Formosa, Mr. H. Sauter coll.¹⁾

There is also a female specimen captured at Shimpukuji, Prov. Mino, in the collection of the Nawa Entomological Laboratory, Gifu.

Remark: Short and imperfect as is the original description given by Walker, the specimens on hand agree with it so well that I cannot help identifying them with the species. If this identification be correct, I think Gerstæcker's *Osmylus modestus* from Java should also be

1) This specimen I owe to the kindness of Mr. Petersen of Denmark.

identified with *tuberculatus*, since Japanese and Formosan specimens just mentioned agree well with his description of *modestus*.

The tubercle on wing, which has often been considered to be peculiar to the male, is in fact present in both sexes, and shows no difference in the different sex.

Spilosmylus nikkoënsis (Navás).

Lysmus nikkoënsis Navás, Rev. Russ. d'Entom., vi, p. 113, fig. 3 (1911).

Head fuscous black, with two large yellow spots in hind marginal area; ocelli yellow, margined with the same color; clypeus entirely yellow; antennæ yellow with long hairs, a few basal joints darkish, the 3rd joint longer than the 2nd.

Prothorax yellowish with a longitudinal fuscous line, which is occasionally nearly interrupted in the middle, and with two spots on both sides of the line, but these markings vary to a certain extent in different specimens; both sides of prothorax beset with long, pale testaceous hairs.

Meso- and metathorax also yellowish; praescutum of the former with a median blackish line and two black spots on anterior margin; scutum also with two spots on both sides anteriorly; irregular median line present on scutellum.

Abdomen brown above, with a few pale hairs; ventral side yellowish; boat-shaped genital appendage of females dark yellow.

Legs pale yellow, with end of hind-femora fuscous; claws commonly with teeth, but often without them, testaceous, strongly curved.

Forewing not very broad, subacute at apex, inner marginal and apical areas slightly clouded with grey; pterostigma yellowish with brown veinlets on both sides; neuration mostly fuscous; subcosta and radius yellowish, interrupted several times with fuscous spaces; most cross-veins margined with dark brown, forming some small spots at base and at middle as well as beyond middle of the wing.

All the costal veinlets simple; radial sector with 10-12 branches; two series of gradate veinlets irregular and scarcely parallel.

Hindwing with inner marginal area only occasionally slightly clouded with brown; pterostigma slightly fuscous yellow.

Measurements:

Length of body 9-10 mm.

„ „ forewing 16-19 „

Width of „ 6.5-7 „

Length of hindwing 14-15 „

Hab.: Specimens from the following localities are in my collection:

Prov. Harima, Mr. S. Iguchi coll.

Prov. Wakasa, Mr. I. Isaki coll.

Mt. Kinbō near Kumamoto, Mr. K. Yokoyama coll.

Yanagawa, Prov. Chikugo, Mr. T. Takamuku coll.

Hokkaido(?), Mr. H. Okamoto coll.

Mt. Natsusawatōge, Prov. Shinano; Kyoto; Yoshino, Prov. Yamato; Mr. A. Nohira coll.

Remark: Petersen (l.c.) said that Navás *Lysmus nikkoënsis* is probably referable to *tuberculatus*, but I am decidedly of the opinion that the two are distinct. It may be doubted if the female specimen, which he considered to be *tuberculatus*, really represented that species.

Spilosmylus flavicornis (MacLachlan).

Osmylus flavicornis MacLachlan, Trans. Ent. Soc. Lond., ii, p. 179-80 (1875).

Osmylus faurinus Navás, Ann. de la Soc. Scient. Brux., p. 192 (1910).

Lysmus faurinus Navás, Rev. Russ. d'Entom., xi, p. 114 (1911).

Osmylus ?? *flavicornis* Krüger, Stett. Ent. Zeit., p. 271 (1913).

Head yellow, ocelli yellow, broadly margined with same color;

clypeus and labium variegated with fuscous; palpi darkish; antennæ yellow with long hairs, a few terminal joints blackish.

Prothorax yellow with three blackish spots placed in a triangle above, and with blackish or pale hairs on both sides. Mesothorax yellowish, spotted with fuscous; metathorax fuscous yellow.

Legs pale yellow, darker near end of tarsi; claws simple, strongly curved.

Abdomen blackish, spotted with yellow, especially on ventral side and at apex; boat-shaped female organ ochraceous yellow, more or less suffused with piceous.

Forewing not broad, subacute at apex, vitreous, with about ten minute piceous spots on cross-veins, two pretty large ones in basal area, a large spot formed of several smaller dots in middle, an irregular line on outer gradate veins, and some spots close together near apex; inner marginal and apical areas clouded with light brown; two fuscous spots on both sides of pterostigma. Principal veins mostly pale yellow; cross-veins piceous.

Costal cross-veins mostly simple; radial sector with 11-13 branches; two series of gradate veins rather irregular and scarcely parallel.

Hindwing usually without marking excepting the brownish pterostigma; gradate veins sometimes margined with fuscous.

Measurements:

Length of body.....	7.5-11 mm.
„ „ forewing	15-18 „
Width of „	5-6 „
Length of hindwing.....	14-17 „

Hab.: Sapporo, Mr. H. Okamoto coll.

Mt. Ibuki, Prov. Mino, Mr. Y. Nawa coll.¹⁾

Matsuyama, Prov. Iyo, Messrs. Nagai and Takahashi coll.

Yanagawa, Prov. Chikugo, Mr. Takamuku coll.

1) The single male specimen in the collection of the Nawa Entomological Laboratory.

Yoshino, Prov. Yamato, Mr. A. Nohira coll.

Tokyo, Mr. A. Nohira coll.

Remarks: *Osmylus faurinus* Navás seems to me to be a variational form of this species, since the latter is very variable even in the markings of prothorax which usually form a well fixed specific character. Wing markings are especially variable; my Sapporo specimen has the markings considerably restricted, while in the Matsuyama specimen, they are strongly pronounced even on hindwing.

Spilosmylus immaculatus n. sp.

Head yellow, with a black triangular spot on top, swollen and blackish behind, blackish also around eye; face, clypeus and palpi yellowish. Antennæ long, dark yellow, with concolorous hairs; all the joints, excepting the basal one, are nearly equal in length.

Prothorax yellow with an M-shaped blackish mark and a broad median blackish line above. Meso- and metathorax brownish all over.

Legs pale yellow, suffused with darkish at end of tarsi; claws with teeth, strongly curved.

Abdomen fuscous with a few hairs, spotted with orange yellow, especially on ventral side and at apex; boat-shaped female organ yellowish, unusually small.

Forewing broad, subacute at apex, vitreous; neuration mostly pale, but partly slightly greyish; without spot except on pterostigma which is very slightly darkish on both sides.

Nearly all costal cross-veins simple, but the two or three near base of wing are furcate; radial sector with about ten branches.

Hindwing almost without marking; pterostigma mostly faintly marked with grey.

Measurements:

Length of body 12 mm.

„ „ forewing 19 „

Width of forewing 7 mm.

Length of hindwing 17 „

A single female specimen was captured by the author on Mt. Ozetōge, Prov. Kōzuke, July 31, 1913.

Remark: Though resembling *S. Harmandinus* (Navás) and *S. nigricornis* n. sp., this species is peculiar in having no spot on wings excepting greyish pterostigma. Besides, this species differs from the two mentioned in coloration and in structure of body, antennæ, female genital appendage, etc.

Spilosmylus Harmandinus (Navás).

Osmylus flavicoruis Matsumura, Thous. Ins. Jap., i, p. 178, pl. xiii, fig. 7, ♀ (1904), nec MacLachlan.

Osmylus Harmandinus Navás, Ann. de la Soc. Scient. Brux., p. 190-91 (1910).

Lysmus Harmandinus Navás, Rev. Russ. d'Entom., xi, p. 113 (1911).

Head yellowish with an elongate black spot on vertex; greater part of face, including labium, blackish; palpi darkish; ocelli yellow; antennæ yellow, with numerous long concolorous hairs.

Prothorax yellow with three longitudinal fuscous lines, of which the median is much longer and broader than the other two; with numerous black or pale hairs on both sides.

Meso- and metathorax yellowish, with several fuscous spots of various sizes.

Legs yellow, with pale hairs; hindleg much darker than other legs; claws scarcely serrate.

Abdomen fuscous black with pale hairs, spotted with yellowish especially on lateral side and at apex.

Forewing broad, vitreous; neuration mostly blackish, but partly pale; subcosta and radius with a few strongly marked blackish and pale alternate spaces; three blackish spots along cubital vein, the

outermost spot being the smallest and the median the largest; pterostigma yellowish with some thickened black veins on both sides.

Costal cross-veins mostly simple, only occasionally a few of them are furcate; sector with nine or ten branches; two series of gradate veins rather irregular and scarcely parallel.

Hindwing without prominent marking, excepting yellowish pterostigma which is marked with fuscous on both sides.

Measurements :

Length of body	10 mm.
„ „ forewing	18 „
Width of „	6.5 „
Length of hindwing	15 „

A single male specimen, captured by Mr. H. Okamoto at Sapporo, is in my collection.

Remark: *Osmylus flavicornis* described and figured by Prof. S. Matsumura in his work entitled "Senchū-zukai" seems to be identical with Navás' *O. Harmandinus*, and so I place doubt on the status of the species recently recorded by the same author¹⁾ from Saghalien under the name of *flavicornis*.

Spilosmylus nigricornis n. sp.

Head blackish, swollen above, with long strong hairs; hind margin of head and mouth-parts fuscous black; narrowly brown around eye; antennæ black or piceous, somewhat brownish towards tip.

Prothorax dark yellow, with a narrow median longitudinal line which widens towards both its anterior and posterior ends; two black spots on each side of the line. Meso- and metathorax blackish; lobes more or less swollen, shiny black.

Legs fuscous yellow; claws rather short, not so strongly curved, testaceous, with a few teeth.

1) Erster Beitrag zur Insekten-Fauna von Sachalien, Journ. Coll. Agr., Tohoku Imp. Univ., iv, p, 15 (1911).

Abdomen blackish, with pale hairs; boat-shaped female organ black, with a yellow transverse band.

Forewing broad, vitreous, with black neuration, subacute at apex; subcosta and radius yellowish with several short black spaces; pterostigma yellowish, marked with two large black spots; a black spot exists in a middle cubital cell; several small spot present near base of the wing.

Costal cross-veins mostly simple, though usually a few of them are furcate; sector with 8-11 branches; series of gradate veins somewhat irregular.

Hindwing without marking except on pterostigma which is similarly marked as that of forewing.

Measurements:

Length of body	9—12 mm.
„ „ forewing	15—19 „
Width of „	5.5—7 „
Length of hindwing	13.5—17 „

Nine female specimens and a single male specimen captured by the author on the shore of Lake Oze, Prov. Kōzuke, on Aug. 1, 1913.

Genus **Osmylus** Latreille.

Osmylus Latreille; Walker, Cat. Neuropt. Brit. Mus., ii, p. 231 (1852); Banks, Trans. Amer. Ent. Soc., xxxix, p. 212 and 215 (1913); Krüger, Stett. Ent. Zeit., p. 38 (1913).

Osmylina Schneider, Monog. Chrysop., p. 36 (1851).

Hyposmylus MacLachlan, Ent. Month. Mag., vi, p. 200 (1870); Krüger, l.c., p. 48.

Parosmylus Needham, Rec. Ind. Mus., iii, p. 309 (1909).

Dictyosmylus Navás, Ann. de la Soc. Scient. Brux., p. 189 (1910); Krüger, l.c., p. 49.

Plethosmylus Krüger, l.c., p. 43.

I agree with Banks in regarding *Hyposmylus*, *Parosmylus* and

Dictyosmylus to be synonyms of *Osmylus*. Moreover, I think that Krüger's *Plethosmylus* is also to be made a synonym of it. *O. hyalinatus* M'L., for which he made that new genus, is a species which stands very near to the type of *Osmylus*, *O. maculatus* F., as was pointed out by MacLachlan.

Consequently, the genus should in my opinion be defined as follows:

Three ocelli present, placed close together. Legs with entire empodia; a spur exists on coxa I in female of most species. Wings broad; media of forewing forked near base; costal cross-veins mostly furcate, sometimes two adjoining veins cross each other or are connected by a short cross-vein; cubitus of both wings has a branch running parallel to it for a considerable distance.

The structure of coxa I, which had never before been used for the systematic purpose by any entomologist except Needham (l.c.), who utilized it for generic distinction, seems to afford a useful differential character for the distinction of species. All the Japanese species of the genus may be distinguished thus:

1. Coxa I without spur, but with a somewhat dilated portion instead *tessellatus*.
- Coxa I with spur¹⁾ 2.
2. The spur crooked *Pryeri*.
- The spur not crooked 3.
3. The spur rather long, not directed upward, nor dilated at apex *hyalinatus*.
- The spur short, directed distinctly upward and dilated at apex *decoratus*.

***Osmylus tessellatus* MacLachlan. Fig. 2.**

Osmylus tessellatus M'Lachlan, Trans. Ent. Soc. Lond., ii, p. 180 (1875).

1) So far as known, the spur is peculiar to the female.

Osmylus? tessellatus Krüger, Stett. Ent. Zeit., p. 270 (1913).

Head black, swollen above; face yellowish with a large furcate black mark between antennæ; antennæ black with a yellow ring around base; ocelli minute, yellow, the foremost one a little apart from the remaining two; palpi fuscous black.



Fig. 2.

Coxa I of *Osmylus tessellatus*
M'L. 20 x.

Prothorax bright piceous, with grey pubescence, posteriorly slightly suffused with yellow; a distinct small yellow spot exists anteriorly in the middle.

Meso- and metathorax piceous, faintly marked with fuscous.

Legs pale yellow, with hairs of same color; hindleg somewhat brownish, especially on femora; end of tarsi darkish; coxa I without spur, but with a somewhat dilated portion instead; claws rather long, with teeth.

Abdomen fuscous black, darker at base, slightly suffused with yellow on lateral sides; last two segments variegated with ochraceous yellow, much hairy; boat-shaped female organ fuscous, yellowish along margin.

Forewing broad, subacute at apex; neuration blackish, partly pale; subcosta and radius yellowish with black spaces, the former commonly darker than the latter; most discal cross-veins broadly margined with dark grey, giving the wing a chequered appearance; some darkish spots on disk and also near apex; pterostigma yellowish with two darkish spots; inner marginal area irregularly marked with greyish; several dark spots along radius; costal cross-veins mostly blackish, but partly pale so as to cause irregular pale and blackish alternate spaces.

Costal cross-veins mostly furcate, some of them in basal area of wing being simple; radial sector with 10-16 branches; discal cells mostly quadrate, irregular in arrangement.

Hindwing hyaline, rarely very slightly tinged with greyish; with-

out marking except a few spots on pterostigma and very faintly clouded spaces along inner margin.

Measurements :

Length of body	14—15 mm.
„ „ forewing	24—26 „
Width of „	9—10 „
Length of hindwing.....	22—24 „

A male specimen captured by Mr. A. Nohira on Mt. Atago, Kyoto, May 1st '12, and two female specimens captured by Mr. T. Takamuku at Yanagawa, Kiushiu, are in my collection.

Remark: In structure this species resembles certain *Spilosmylus* species more closely than the other three species of the genus.

***Osmylus Pryeri* MacLachlan. Fig. 3.**

Osmylus Pryeri M'Lachlan, Trans. Ent. Soc. Lond., ii, p. 180-81 (1875).

Osmylus? Pryeri Krüger, Stett. Ent. Zeit., p. 270 (1913).

Head yellowish, swollen above; transverse area between bases of antennæ broadly blackish; vertex darkish, especially along margin; clypeus yellow; mouth-parts including palpi darkish; antennæ black.

Prothorax yellowish with blackish hairs; side and hind margin blackish. Meso- and metathorax blackish; lobes much swollen.

Legs pale, sometimes fuscous; coxa I with a crooked spur; claws serrate internally.

Abdomen black with pale hairs, the last segment being especially hairy; boat-shaped female organ of usual structure.



Fig. 3.

Coxa I of *Osmylus Pryeri* M'L. 20 ×.

Forewing acute at apex; neuration mostly blackish, subcosta yellowish, radius also yellowish but partly blackish, a few cross-veins narrowly margined with grey or fuscous; inner

marginal and apical areas clouded with fuscous or grey; a few fuscous spots along posterior side of radius.

Costal cross-veins mostly furcate, excepting those at base of wing; radial sector with ten branches; two series of gradate veins complete and nearly parallel.

Hindwing colorless and hyaline, excepting brown pterostigma.

Measurements:

Length of body	14 mm.
„ „ forewing	25 „
Width of „	9 „
Length of hindwing.....	23 „

Hab.: A single specimen captured at Nikko(?) is in the collection of the Imperial Agricultural Experiment Station, Tokyo.

Also a single specimen captured at Hikage, Prov. Mino, is in the collection of the Nawa Entomological Laboratory, Gifu.

Further, two specimens from Kamikōchi, Prov. Shinano, captured by Mr. S. Kawai, and from Tokura, Prov. Kōzuke, captured by me, are in my own collection.

Remark: The Nikko(?), Hikage, and Tokura specimens agree very well with the original description in wing-markings, while the Kamikōchi specimen deviates from it in the much restricted markings of wings. In the specimen just referred to, the inner marginal area is not uniformly greyish fuscous, but is irregularly clouded with that color; the ill-defined irregular line running to the wing apex is broken up into pieces, though it is not difficult to trace.

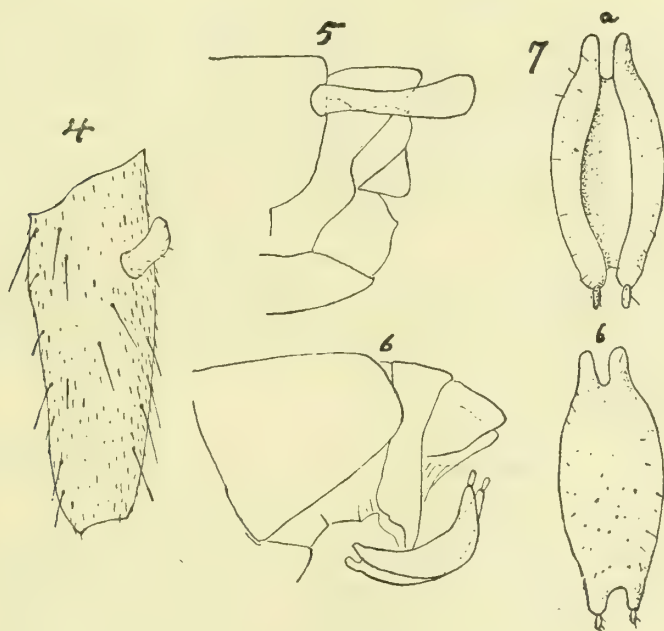
Osmylus decoratus n. sp. Figs. 4—7.

Head yellow with a fuscous x-shaped mark between antennæ; vertex exceedingly swollen; ocelli dark brown; two very minute tubercles behind ocelli; frons and clypeus yellowish; palpi with most joints nearly equal in length; antennæ deep black with few hairs.

Prothorax blackish, with a broad longitudinal median band of

yellow above; numerous long hairs on both sides. Meso- and meta-thorax blackish; scutellum and postscutellum somewhat yellowish.

Legs pale yellow with concolorous hairs, terminal tarsal joint marked with blackish brown; claws usually strongly serrate internally; coxa I with a short spur, which is directed distinctly upwards and is dilated at apex.



Figs. 4-7.

Osmylus decoratus n. sp.

4, Coxa I, 20 x. 5, Male genitalia, 10 x. 6, Female genitalia, 10 x.

7, Boat-shaped apparatus of female, 15 x;

a, seen from below; b, seen from above.

Abdomen black, with pale yellow hairs; apex yellowish; ventral side spotted with yellow. The last segment in the female very short, split below; boat-shaped organ suspended from the 9th segment by a single sclerite and a somewhat flexible membrane; bilobed at both anterior and posterior ends; the posterior end with two palps on tip of the lobes; marginal area turned downward so as to give the organ

a boat-like shape. In the male, there exist two slender lobes (which are variable in size and shape, and appear to be slender free sacs of an unknown character) at the base of suranal plate; besides, there are two pairs of appendages arising from the last abdominal segment.

Forewing elongate and broad; neuration mostly black but partly pale; subcosta and radius pale yellow; inner marginal area irregularly clouded with grey, causing pale and dark spaces; some darkish spots on pterostigma and near apex; a single darkish spot on disk.

Nearly all costal cross-veins furcate, and several of those at base are united by a short cross-vein; radial sector with 12-16 branches; discal cross-veins numerous and irregular in arrangement; discal cells hexagonal or quadrate, becoming very much elongate towards outer margin.

Hindwing hyaline with dark markings on pterostigma; inner marginal area slightly clouded with pale grey.

Measurements:

Length of body 13-15 mm.

„ „, forewing 26-37 „

Width of „ 10-10.5 „

Length of hindwing 23-24 „

Hab.: Kusakimura, Prov. Harima; two pairs (♂ ♀), Mr. Iguchi coll.

Prov. Wakasa, a single female specimen, Mr. Isaki coll.

Prov. Chikugo, Kiushiu, a single male specimen, Mr.

Takamuku coll.

All the above six specimens are in my collection.

Remark: This species is closely allied to *O. tessellatus* and *O. hyalinatus*, but is distinguishable from both these by markings of head and prothorax, structure of coxa I, etc.

***Osmylus hyalinatus* MacLachlan. Fig. 8.**

Osmylus hyalinatus M'Lachlan, Trans. Ent. Soc. Lond., ii, p. 181 (1875).

Plethosmylus hyalinatus Krüger, Stett. Ent. Zeit., 74 Jg., p. 274 (1913).

Head bright yellow without marking; mouth-parts and clypeus somewhat darker; ocelli minute and placed very close together; antennæ black.

Prothorax blackish, variegated with yellow; above three somewhat yellowish longitudinal lines, of which the median is the broadest. Meso- and metathorax fuscous black with pale hairs.

Legs pale yellow; tarsal joints suffused with fuscous; claws commonly serrate internally, rarely without the serration; coxa I has a rather long spur which is however not so long as in *O. maculatus* of Europe.

Abdomen blackish with pale hairs, yellowish at apex. The boat-shaped organ depending from the last abd. segment in the female yellowish, more or less darker along the margin.

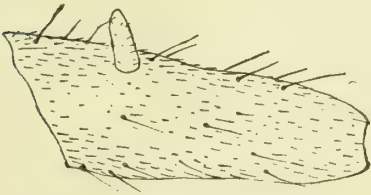


Fig. 8.

Coxa I of *Osmylus hyalinatus*
M.L. 20 x.

Forewing broad, subacute at apex, hyaline with a grey tinge; commonly without spot, sometimes with a small discal spot and some more spots near apex; outer series of gradate veinlets often narrowly margined with faint fuscous; inner marginal area occasionally clouded.

Pterostigma with some dark fuscous spots. Neuration mostly blackish or fuscous; subcosta and radius yellowish, though sometimes pale or dark greyish.

Most costal cross-veins are furcate, except several basal ones, which are simple; here and there two adjoining furcate veins cross each other or are united by a short cross-vein; radial sector with 10-14 branches; two series of gradate veinlets complete and nearly parallel.

Hindwing hyaline, with brownish pterostigma.

Measurements:

Length of body	12—15 mm.
„ „ forewing	21—26 „
Width of „	8—10 „
Length of hindwing.....	18—22 „

Hab.: Of this species, a large number of specimens were received by me from the following localities:

Sapporo, Hokkaido, Mr. H. Okamoto coll.

Kamikōchi, Prov. Shinano, Mr. S. Kawai coll.

Mt. Ibuki, Prov. Ōmi, Mr. S. Yamamura coll.

Prov. Wakasa, Mr. I. Isaki coll.

Prov. Harima, Mr. S. Iguchi coll.

Matsuyama, Prov. Iyo, Messrs. T. Nagai & Takahashi coll.

Kyōto, and Tottori, Prov. Inaba, Mr. A. Nohira coll.

Further, a series of specimens from various localities on the main island of Japan is contained in the collection of the Imperial Agricultural Experiment Station, Tokyo. They were kindly shown me by Dr. T. Miyake.

Remark: So far as the wing-markings go, this species is very near to *O. decoratus*.

The prothorax in the Kamikōchi specimens shows a coloration variegated with deep black, on which account I have at first doubted if those specimens did not represent a species distinct from *O. hyalinatus*.

P. S. While this paper was under press, I have received Mr. Okamoto's paper "Zwei neue Arten der japanischen Osmyliden," Ent. Mitt., Band iii, Nr. 1, Jan. '14. To my regret, I can not accept the two species described by him as new under the names of *Osmylus* (*Lysmus*) *japonicus* and *O. (L.) nipponensis*. In my view they are identical with *Spilosmylus tuberculatus* (Walker) and *S. nikkoënsis* (Navás) respectively.

On a new Epicaridan Isopod

(*Athelges takanoshimensis* sp. nov.) from *Eupagurus samuelis* Stimp.

By

S. Ishii, *Rigakushi*.

With Plate VII.

During last summer, while staying at Takanoshima, an islet near the entrance to the gulf of Tokyo, my attention was called to an Epicaridan Isopod belonging to the genus *Athelges* and found parasitic on hermit-crabs which were kindly determined for me by Mr. Terao to be *Eupagurus samuelis* Stimps. On study, the *Athelges* turned out to represent a species which seems to be new to science. I propose to call it *A. takanoshimensis*.

As in other Epicarids, the species shows marked sexual dimorphism. The male is, as compared with the female, of a very diminutive size besides being of a very different appearance, and is usually found clinging to the metasome of the female in the manner of a parasite.

1. Adult female.

The female is found attached, by means of its prehensile legs, to the anterior part of the dorsal surface of the metasome of the host. It stands in contact with the host surface by the entire extent of its dorsal mesosome surface. Consequently, all the prehensile legs are more or less twisted and dorsally directed. The marked concaveness of the dorsal surface is due to the above mode of attachment. All the females were invariably found with the head directed backwards in relation to the host body.

Measurements taken from 3 female specimens are as follows:

Spec.	Body without tail.		Length of tail.
	Legth.	Width in the widest part of mesosome.	
A	5 mm.	3,5 mm.	3,5 mm.
B	7 "		5 "
C	6 "	3,5 "	4 "

Cephalon. The cephalon is small and of a roundish shape. In specimen C, it is 0,8 mm. long and about as wide. It is deeply sunk into the mesosome, and can be seen only from the dorsal side after detachment from the host. Eyes are present in a pair in the anterior part of the cephalon. They are feebly developed and usually not clearly visible from the outside, being more or less concealed under adjacent legs. There are two pairs of rudimentary antennæ. Measurements of them taken from specimen C are as follows:

First or inner antennæ (3-jointed):

Basal joint, 0,140 mm. long, 0,140 mm. thick.

Middle „ 0,048 mm. „ 0,040 mm. „

Distal „ 0,020 mm. „ 0,028 mm. „

Second or outer antennæ (7-jointed)¹⁾:

Basal joint

2nd joint, 0,160 mm. long, 0,080 mm. thick.

3rd „ 0,084 mm. „ 0,060 mm. „

4th „ 0,072 mm. „ 0,042 mm. „

5th „ 0,032 mm. „ 0,024 mm. „

6th „ 0,032 mm. „ 0,016 mm. „

7th „ 0,010 mm. „ 0,008 mm. „

1) In one case, one of the second antennæ was observed to be 5-jointed.

Each joint is provided with a greater or less number of short stiff hairs, which decrease in length from distal towards proximal joints. The surface of proximal joints is beset with numerous minute spinous processes.

The mouth is guarded by a pair of mandibles, which are provided in the distal parts with minute curved hooks. These hooks are found on both inner and outer sides of the mouth opening (Pl. VII, Fig. 3).

The maxillipeds are lamellar. Each is composed of two segments, of which the anterior is larger than the posterior. The anterior segment is anteriorly usually rounded, but sometimes narrowed and obtusely pointed; without hairs; posterior outer margin concave, with two powerful muscles attached close to it; two short beak-like projections may be seen at the outer border. Anterior end of the posterior segment is elongate and acutely pointed, overlapping the anterior segment at base. No epignath was observed.

Mesosome. Mesosome segments are best defined along the median line of the dorsal surface. The first segment is very narrow and band-like, flanking the cephalon on sides. Length of each mesosome segment in specimen C, as follows.

1st or foremost segment, 0,1 mm.

2nd segment, 0,3 mm.

3rd „ 0,5 mm.

4th „ 0,6 mm.

5th „ 0,8 mm.

6th „ 0,8 mm.

7th or hindmost segment, 0,8 mm.

Sars seems to consider the assymetry of body in adult male *Athelges* to constitute one of the characteristic features of the genus. At a place he remarks: "The peculiar contortion of the body in fully grown female specimens has not yet been sufficiently recognized, for the species have generally been described as perfectly symmetrical or nearly so, an appearance which is only exhibited by immature

specimens."¹⁾ In the specimens before me, the greater parts of the mesosome does not exhibit contortion to any marked degree, though in the hindmost parts a slight twisting, corresponding to that of the metasome, may often be noticed.

Thoracic legs. There are seven pairs of thoracic legs, arranged along sides of the body on the dorsal aspect. They are all prehensile in function and similar in structure. Legs of the first pair are the smallest, those of the second not so large as any other of the more posterior pairs. Each leg is composed of apparently five joints,²⁾ not including the coxal piece; of the joints the two proximal ones are the longest, the third and fourth of a medium size, and the fifth the smallest. The fourth is of a somewhat ovoid outline; a set of two powerful muscles is seen arising from one end and converging towards the base of the fifth joint, which is of a beak-like appearance and together with the fourth forms a chelate arrangement. The cuticula of the fourth joint is, in the parts which come in contact with the beak-like fifth joint in the depressed state, is considerably thickened, and moreover presents a more or less roughened surface. The distal end of the third joint is provided with a number of minute obtusely pointed cuticular processes (Pl. VII Fig. 5, *c.p.*). The third and fourth joints seem to be firmly jointed together. No conspicuous muscle seems to occur in the third joint. Measurements of the right leg of the sixth pair from specimen C, as follows:

1) G. O. Sars,—“An account of the crustacea of Norway,” vol. 2, Isopoda, p. 210, 1899.

2) According to the figures given by G. O. Sars (*loc. cit.*), it seems that the legs in *Athelges paguri* (Rathke) are six-jointed. Sars also represents six-jointed legs for other Epicaridan parasites. The third and fourth joints as represented in the figures of Sars together seem to correspond to the single third joint of my specimens. There exists a constriction near the middle of this joint; it is less marked in the male than in the female (Pl. VII Fig. 5). It probably indicates the origin of the joint by fusion of two originally separate segments. The third joint is possibly a combination of carpus and meros, while the first joint corresponds to the basos of an ordinary Isopod leg.

	Length.	Width.
1st or proximal joint,	0,455 mm.	0,327 mm.
2nd joint,	0,419 mm.	0,218 mm.
3rd „	0,255 mm.	0,164 mm.
4th „	0,291 mm.	0,164 mm.

Exposed length of the beak-like fifth joint, 0,091 mm.

Marsupial plates. Of marsupial plates there are five pairs. Those of the first or foremost pair are of a somewhat complicated structure and differ considerably in shape from all the other, each plate of that pair being made up of two parts, the anterior and the posterior, divided from each other by a distinct constriction (Pl. VII Fig. 6). The anterior part is much the larger, it is folded so as to present a small dorsal and a large ventral lobe. It is by the posterior inner margin of the former that the plate is attached to the body. The posterior part of the plate is relatively small and narrow, its posterior inner margin is provided with a series of a few (five or six) short hair-like processes. The folded edge of the anterior part is exposed to the outside, projecting far beyond the anterior end of the animal, while all the remaining parts are hidden under the following pairs of marsupial plates. Plates of the second pair are simple, each presenting a more or less cup-like form; the anterior margin is concave, while both the inner and posterior margins are slightly convex. The posterior margin as well as a part of the inner and outer margin are provided with a series of short hair-like processes. The plate is attached to the body by a part of its outer border, and is completely covered over by the next pair, so that it is not at all visible on the outside. The third, fourth and fifth pairs are generally similar to the second in shape. However, in all these pairs the anterior margin of the plates is not concave as in the second; on the contrary, it is slightly convex. The hair-like processes on the posterior margin of the fifth pair are considerably longer than those of other pairs. The marsupial plates gradually increase in size with every pair posteriorly,

the foremost being the smallest and the hindmost the largest. The convexity of the plates also increases gradually in the more posteriorly situated ones, the fifth pair being in part so vaulted as to present an almost pouch-like appearance.

Metasome. The body is abruptly narrowed at the somewhat cylindrical metasome, which thus stands in conspicuous contrast with the massive mesosome. At base rather thick, it gradually tapers distally, finally to terminate with a clavate end-piece. The metasome is usually slightly bent towards the left side of body. It is fairly distinctly segmented, showing six segments inclusive of the clavate end-piece.¹⁾ Appendages of the metasome or the pleopods are present in only four pairs, the two hindmost segments being devoid of any appendage. The pleopod is attached to the posterior part of the segment it belongs to, and is composed of two ovate or subcircular plates, each with a short stalk and both connected by a short common stalk to the metasome. The size of pleopod is usually larger in anterior than in posterior pairs. All the pleopods seem to be of respiratory nature. Measurements of the metasome taken from specimen A are as follows:

Length of entire metasome, 3,5 mm.

Thickness at base, 0,8 mm.

Length of the two distal segments without appendages taken together, 1,31 mm.

Pleopod of the 1st pair,		
	Length including stalk.	Width.
One of the plates	1,037 mm.	0,651 mm.
The other plate	0,946 mm.	0,688 mm.

1) Sars states of the genus *Athelges* in general that the metasome consists apparently of only 5 segments, and that the last 2 segments are united to a narrow, more or less claviform piece, although he figures 6-segmented metasome for *Athelges tenuicaudis* G. O. Sars (*loc. cit.*, pp. 209, 210, and Pl. 89).

Pleopod of the fourth pair,		
	Length including stalk.	Width.
One of the plates	0,801 mm.	0,400 mm.
The other plate	0,783 mm.	0,491 mm.

No uropod exists. Sometimes, but not always, two or four knob-like tubercles are observed near tip of the distalmost segment, which tubercles were considered by Sars to be the rudiments of uropods.¹⁾

2. Adult male.

The adult male has thick body of an oblong outline, usually somewhat convex dorsally and concave ventrally. It is of a whitish colour. Measurements of a male taken from the female specimen B, as follows:

Length of cepalon,	0,255 mm.
Length of mesosome,	1,474 mm.
Length of metasome,	0,692 mm.
Greatest width of body,	0,855 mm.

The cephalon is somewhat halfmoon-shaped. There exists on the dorsal surface a pair of distinct but irregularly outlined eyes, widely apart from each other and situated near the posterior margin of cephalon. In one specimen I have observed a pair of small and shallow depressions situated near the middle of the dorsal surface of cephalon; each of them presented a somewhat reniform shape measuring 72μ in length and lying obliquely so as to be nearly parallel with the side of cephalon.

The antennæ are short and usually hidden under the cephalon, except the tips of the second pair. The very short first antennæ are composed of three joints. The second are slightly longer, and consist

1) *loc. cit.* p. 209.

usually of seven joints, of which the distal three are very minute and bead-like. In the male taken from the female specimen B, I have observed that the right second antenna was made up of eight joints of which four were bead-like, while the left side one exhibited only seven joints as usual, a fact which stands in accord with what Thielemann¹⁾ has stated for Isopods generally to the effect that even in one and the same individual the antennæ of both sides are mostly somewhat, often strongly, assymmetrically developed. Lengths of right side antennæ of the male just referred to are: first antenna 0,118 mm. and second antenna 0,272 mm. (both exclusive of hairs). The basal joint of second antennæ is without hairs, the second shows one or two short hairs near its antero-distal end; other joints of that antenna, as also all the joints of the first, are provided with a variable number of short hairs at their disal end.

The mouth parts project under the base of antennæ as a prominent conical process, at the tip of which the styliform ends of mandibles may be seen. The free end of the mandible seems to become cornified, and is of a brownish colour. It is pointed and very slender, having a thickness of only 3μ near tip.

The mesosome is distinctly segmented, the segments being separated from one another by deep incisions in the lateral parts. There are seven segments in all. These are of much the same appearance, except in the fact that those nearer to both the cephalon and the metasome are somewhat smaller than those in the middle. Measurements of mesosome segments in the male taken from the female specimen B are as follows:

	Length.	Width.
1st or the foremost segment of mesosome,	0,164 mm.	0,692 mm.
2nd segment of mesosome,	0,182 mm.	0,783 mm.
3rd " " "	0,237 mm.	0,837 mm.
4th " " "	0,218 mm.	0,855 mm.
5th " " "	0,218 mm.	0,801 mm.

1) Thielemann,—“Beiträge zur Kenntniss der Isopodenfauna Ostasiens,” p. 6, 1910

	Length.	Width.
6th segment of mesosome,	0,237 mm.	0,746 mm.
7th " " "	0,218 mm.	0,655 mm.

Each segment of the mesosome has a pair of legs. The leg is much like that of females in structure. As in these it is composed of five joints exclusive of the coxal piece, of which the first, the second and the fourth are larger than the third and the fifth. The fourth is of an oval outline and forms a chela with the claw-like fifth joint. The fourth joint shows at the proximal end a few (some seven or eight) short tooth-like processes varying from 4 to 8μ in length. The third joint has a few minute spinous processes near the distal end and a single similar process near the middle. Measurements of the fourth left leg of the male taken from the female specimen B are as follows:

Length of the 1st or proximal joint,	0,220 mm.
Length of the 2nd joint,	0,160 mm.
Length of the 3rd joint,	0,076 mm.
Length (longest diameter) of the 4th joint,	0,196 mm.
Length of the exposed claw of the fifth joint,	0,060 mm.

The metasome is small and not divided, all the segments composing it being completely coalesced into a single plate-like urus. It is of a triangular shape, attached with base to the mesosome. The posterior end is obtusely pointed, and here the small anal opening is situated. No appendages exist on the metasome. Along each side on the ventral surface there stand at intervals three or four short hairs; besides, near the posterior end, there is a group of similar hairs. Also on the dorsal surface hairs are present in similar arrangement; only a posterior group of them is wanting. (The cephalon and the mesosome are also sparsely covered with hairs of the same kind.)

The eggs are generally spherical in shape, though often modified into polygonal as the result of mutual pressure in the brood chamber. They measure on an average 0,168 mm. in diameter. They occur in the brood chamber in a very large number.

3. Larva.

In the brood chamber of an adult female I have discovered a number of larvæ in the *Microniscus*-stage. Measurements of an average sized larva:

Total length of body, 0,280 mm.

Length of cephalon, 0,068 mm.

Breadth of cephalon, 0,160 mm.

Length of mesosome, 0,128 mm.

Breadth of mesosome, 0,156 mm.

Length of metasome, 0,084 mm.

The cephalon is halfmoon-shaped. It exhibits on the dorsal surface a number of variously sized brownish-black spots, arranged in an irregular group near the posterior margin (Pl. VII Fig. 10). Similar but smaller spots are also present on the mesosome. I could not however find distinct eyes such as were figured by Sars¹⁾ for the embryo of *Phryxus abdominalis* (Kröyer) and for *Microniscus*. The first antenna is short and is usually antero-laterally directed. It consists of three joints and has a length of 0,024 mm. excepting the hairs. The second antenna is longer than the first, having a length of 0,280 mm.; it is usually posteriorly directed. It is provided with a long distal flagellum and six short proximal joints, of which the two distalmost are more slender than the rest. At base of flagellum, there often exists a bristle of some length beset with a few minute spinous processes on one side. In many specimens the fourth joint also shows a long bristle at the distal end. The mouth is situated on a small elevation between bases of antennæ. It is guarded by two pairs of appendages yet weakly developed.

The mesosome is distinctly segmented, being composed of seven similar segments. There are six pairs of legs. Each leg is composed of five joints excepting coxal piece and is of a similar structure and

1) *loc. cit.* Pl. 91 and 92.

appearance as that of the adult, except in being generally somewhat more slender. The fourth joint is ovoid in shape; the fifth is claw-like and comparatively very thin and long. Legs of the posteriormost one or two pairs are usually slightly smaller in size than more anteriorly situated ones. Measurements taken from the first left leg of a larva are as follows:

Length of 1st or proximal joint,	0,040 mm.
Length of 2nd joint,	0,026 mm.
Length of 3rd joint,	0,012 mm.
Length of 4th joint,	0,034 mm.
Length of exposed claw,	0,024 mm.

The metasome is somewhat smaller than the mesosome. Its posterior end is broadly rounded, excepting the presence of a short median process. It consists of six segments, but is not so distinctly segmented as in the mesosome. There exist five pairs of well developed pleopods, each of which bifurcates into a ventral and a dorsal ramus, the former usually having a single long bristle and the latter two or more of same. The dorsal ramus is articulated to the basal joint, while the ventral one represents only an off-shoot of the latter. The bristles of pleopods are about 76μ long. The uropod is large and powerful, with two equally long branches, each measuring 0,104 mm. in length.

Tokyo, Oct. 25, 1913.

Explanation of Plate VII.

Reference letters.

1.a. First antenna. *1.l.* First leg. *1.m.p.* First marsupial plate.
2. a. Second antenna. *3.* Third joint. *3.m.p.* Third marsupial plate.
4. Fourth joint. *5.m.p.* Fifth marsupial plate. *7.l.* Seventh leg.
a.p. Anterior part. *a.s.* Anterior segment. *cep.* Cephalon. *c.h.* Curved
 hooks. *cl.* Claw. *c.p.* Cuticular processes. *d.l.* Dorsal lobe. *e.* Eye.
l. Legs. *m.* Muscles. *m.o.* Mouth opening. *m.p.* Mouth part. *ms.*
 Mesosome. *mt.* Metasome. *pl.* Pleopods. *p.p.* Posterior part. *p.s.*
 Posterior segment. *t.p.* Tooth-like processes. *up.* Uropod. *ur.* Urus.
v.l. Ventral lobe.

Plate VII.

Fig. 1.—Adult female, dorsal view. $\text{ca.} \times 7$.

Fig. 2.—Adult female, ventral view. $\text{ca.} \times 7$.

Fig. 3.—Mouth of the female specimen C, ventral view. $\times 280$.

Fig. 4.—Left side maxilliped of an adult female. $\times 39$.

Fig. 5.—Terminal portion of sixth right leg of the female specimen C. $\times 130$.

Fig. 6.—First left side marsupial plate of an adult female, dorsal view. $\times 28$.

Fig. 7.—Adult male, dorsal view. $\times 28$.

Fig. 8.—Ventral surface of head of the male, taken from the female specimen B, showing its antennæ and the mouth part. $\times 28$.

Fig. 9.—Fourth left side leg of the male from the female specimen B. $\times 130$.

Fig. 10.—*Microniscus* larva, taken from marsupial chamber of a female, dorsal view. $\times 130$.

Fig. 11.—Ventral surface of head of a larva. $\times 180$.

NOTES ON JAPANESE PROTOZOA with Figures and Descriptions of New and Rare Species.¹⁾

By

C. H. Edmondson and R. H. Kingman.

With Plate VIII.

The fresh-waters of Japan afford a wonderful opportunity for the enthusiastic microscopist. Conditions under which simple organisms thrive are not wanting anywhere in that country. Flooded rice fields of the lowlands, cool mountain streams and innumerable lakes, large and small, are teeming with low plant and animal forms.

To what extent systematic study of the microscopic fauna and flora of the waters of Japan has progressed, under the direction of the eminent biologists of that county, the writers of this article are not able to state.

With a view of determining the species of Protozoa characteristic of Japan and comparing them with the American forms, microscopic studies were carried on by C. H. Edmondson during July and August, 1912, in various parts of the main island. Beginning with Kobe, observations were made through the central and eastern sections of the country and as far north as Lake Chuzenji.

Material was gathered from rice fields, small pools, streams and lakes. Collections were made from the following large lakes: Lake Biwa, altitude above sea level 328 ft.; Lake Hakone, altitude 2,378 ft.; Lake Chuzenji, altitude 4,375 ft. Since the survey covered a wide

1) This paper appeared originally in the Transactions of the American Microscopical Society, vol. XXXII, pp. 93-102, 1913, and is here reproduced with permission of the authors.

territory with considerable variation in local conditions as well as in altitude, the list of species embodied in this brief report may we represent the characteristic unicellular fauna of the entire country. The portion of the article concerned with Rhizopoda is largely a result of the work of R. H. Kingman, a student of zoology, who identified and studied many forms from preserved material. By comparing the list which follows with numerous local records of observers in America and other parts of the world one sees some added evidence of the wide distribution of many species of Protozoa.

The accompanying figures, prepared by Mr. Kingman from permanent mounts, represent new, or rare species of Rhizopods or forms showing considerable variation.

Phylum PROTOZOA: Subphylum SARCODINA:

Class RHIZOPODA Subclass AMOEBEA.

Order GYMNAMEBIDA.

Family Amoebidæ.

Amœba Ehrenberg. *A. proteus* Leidy; *A. guttula* Duj.; *A. sphaeronucleus* Greef; *A. striata* Penard; *A. radiosa* Ehr.; *A. saphrina* Penard.

The species of this genus were not common in any locality. Material from Myoho-in Temple grounds, Kyoto, furnished the best examples. Large individuals of *A. radiosa* were taken from Lake Hakone.

Hyalodiscus Hertwig and Lesser. *H. rubicundus* H. and L.

But one individual was observed. A very typical form, reddish-brown in color. From a rice field, Kyoto.

Arcella Ehrenberg. *A. vulgaris* Ehr.; *A. discoides* Ehr.; *A. costata* Ehr.; *A. arenaria* Greef.

Of the above species *A. vulgaris* is the more widely distributed

in Japan. Lake Chuzenji and the region of Kyoto furnished the best material.

Centropyxis Stein. *C. aculeata* Stein.

Found in all localities. Very abundant in Lake Hakone. Great variation in size occurs in this species and some very large forms were observed.

Pixidicula Ehrenberg. *P. cymbalum* Penard.

A species rarely observed. Found in material from Lake Hakone. *Lecquereusia* Schlumberger. *L. spiralis* Ehr. (figs. 1-3); *L. modesta* Rhumbler (fig. 4).

These two species are widely distributed in Japan, the former being much more abundant. In the typical *L. spiralis* the aperture is usually directed obliquely toward one side with a prominent hump at the outer base of the neck. In the common form in Japan the aperture is directed almost straight forward, in very rare cases there being a slight prominence at the base of the neck. Common in Lake Hakone. Typical examples of *L. modesta* were found in lakes on Mt. Rokkozan.

L. epistomium Penard, a common species of the high lakes of Colorado, was not observed in Japan.

Diffugia Leclerc. *D. pyriformis* Perty; *D. lobostoma* Leidy; *D. constricta* Leidy; *D. acuminata* Ehr.; *D. tuberculata* Wallich; *D. lebes* Penard; *D. bacilliarum* Perty (fig. 5); *D. elegans* Penard (fig. 6).

Of the species of *Diffugia* in Japan, *D. elegans* is apparently the most common. It is widely distributed and shows a great range of variation. *D. lebes*, not uncommon in some of the lakes of Colorado, was observed but once, in material from the bottom of Lake Hakone.

Pontigulasia Rhumbler. *P. spectabilis* Penard.

But one individual observed. From Lake Hakone. A very typical form.

Quadrulella Cockerell. *Q. symmetrica* Schultze; *Q. symmetrica* var. *curvata* Wailes (fig. 7).

Very typical forms of the species were taken from shallow lakes on Mt. Rokkozan. The variety, observed but once, was found in Lake Hakone.

Nebela Leidy. *N. collaris* Leidy; *N. crenulata* Penard; *N. hippocrepis* Leidy (figs. 8, 9); *N. triangulata* Lang (figs. 10-14).

In the material collected in Japan species of *Nebela* were very rare.

There can be no reason to believe, however, that the genus is not well represented in that country. One individual of the rare species, *N. hippocrepis*, was found in material from Mt. Rokkozan. In the ooze from the rocks along the shore of Lake Hakone and from the border of a shallow lake on Mt. Rokkozan was found a species which is here listed under the name *N. triangulata* Lang.

The Japan species resembles, in some particulars, *Nebela bipes* Carter, as described in Clare Island Survey, Part 65, by Wailes and Penard, and may represent an intermediate form between *N. triangulata* and *N. bipes*.

In the Japan form the shell is very transparent, compressed, irregular in outline with the fundus region inflated in an asymmetrical manner. The aperture is slightly oval.

Great variation exists in the form of the shell and in the arrangement of the plates. In some the plates are circular or oval, distinctly separated from each other with the ground substance of the shell intervening. In others the plates are closely crowded together and very irregular in outline, while in some the plates are regular in outline but distinctly overlap each other.

The irregular inflation of the fundus is a characteristic feature. Usually the posterior lateral borders are expanded into lobes of variable size. In some these prolongations are pointed as in *N. bipes*, but more often they are blunt or rounded. Occasionally the

fundus is truncated posteriorly, sometimes it is strongly concave. The extensions of the fundus are seldom uniform on the two sides of the shell and are never the same in two individuals. Usually the narrow view of the shell presents an irregular outline. The compression of the shell is seldom uniform, but is always stronger at the fundus border.

The size of the Japanese form ranges from 80 to 100 μ in length, including the prolongations of the fundus; from 60 to 80 μ in breadth of fundus and from 28 to 60 μ in the long diameter of the aperture.

No living individuals were observed.

Heleopera Leidy. *H. picta* Leidy.

Material from Mt. Rokkozan furnished the only species of the genus observed. Under high power the plates are seen to be circular, slightly overlapping. Little foreign material is attached to the shell.

Phryganella Penard. *P. hemisphaerica* Penard.

Frequently observed in many localities.

Campascus Leidy. *C. dentatus*, sp. nov. (figs. 15-18).

In 1877 Leidy discovered *Campascus cornutus* in China Lake, Wyoming, at an altitude of 10,000 feet. Apparently the species has not been observed since that time.

More recently Penard described two species of the genus, *Campascus triqueter* and *Campascus minutus*, from the deep lakes of Switzerland. In both species described by Penard the fundus is without the horn-like prolongations of the form observed by Leidy. *Campascus minutus* was reported by Wailes in 1912 from the New York water-supply drawn from Croton Lake Reservoir.

The form under consideration, which is apparently a new species, was found in the ooze taken from the rocks along the shore of Lake Hakone, Japan, in August, 1912.

The description follows: Shell of yellowish, chitinous material similar in general outline to *Campascus cornutus*. Under high power

the shell has the appearance of being distinctly punctate. In some individuals the punctae are arranged in a regular diagonal manner, in others there is no regularity about the arrangement. In no specimens examined can outlines of plates be detected even with the oil immersion lens.

The neck is short and sharply bent, nearly at right angles to the long axis of the shell. The circular aperture is bordered by a thin delicate membrane of approximately 4μ in breadth.

A number of short, blunt, tooth-like prolongations are present on the posterior border of the fundus. From three to seven of these processes are usually present. They vary in size and when numerous give an irregular, crenulated appearance to the posterior edge of the fundus, when the broad side of the shell is viewed.

In Leidy's species the two horns are directed laterally and posteriorly, their tips not projecting beyond the posterior border, giving the fundus a rounded outline when the narrow side of the shell is observed. In this species the teeth-like points are directed backward and project beyond the border, giving the fundus the appearance of terminating in a spine when the narrow side of the shell is seen.

Leidy records the size of *Campascus cornutus* as ranging from 0.112 mm. to 0.14 mm. long by 0.18 mm. broad.

This species of Japan is much smaller. The length of the shell, including the spines and the collar about the aperture, ranges from 60 to 80 μ . Breadth of fundus from 50 to 66 μ .

Greatest thickness, narrow view, 28 μ . Aperture 12 μ in diameter. The living organism was not observed.

Paulinella Lauterborn. *P. chromatophora* Lauterborn (fig. 19).

Empty shells of this very minute form were found in material from the bottom of Lake Hakone and also from shallow lakes on Mt. Rokozan. The shell is composed of five longitudinal rows of plates and possesses a short neck. The Japan form is very typical.

Cyphoderia Schlumberger. *C. ampulla* Ehr.; *C. ampulla* var. *papillata* Wailes.

The species is very common in Lake Hakone and was found in other localities. Considerable variation in size and also in the arrangement of plates occurs. The plates are usually placed in diagonal rows, but this regularity is not always maintained.

The variety was observed but once and that in material from Lake Hakone.

Sphenoderia Schlumberger. *S. lenta* Schlumb.

Very widely distributed and also very common in Japan. The only species of the genus to be determined.

Euglypha Dujardin. *E. alveolata* Duj.; *E. brachiata* Leidy; *E. filifera* Penard; *E. laevis* Perty; *E. ciliata* Ehr.; *E. armata* Wailes.

A few species of this genus are very abundant in Lake Hakone as well as in other localities. Two species, *E. filifera* and *E. ciliata* were rarely observed, the others mentioned are common.

Assulina Ehrenberg. *A. seminulum* Ehr.

Observed in material from Kyoto. A very typical form, chocolate-brown in color.

Plagiopyxis Penard. *P. callida* Penard.

Identified in material from Kyoto. Not common.

Trinema Dujardin. *T. enchelys* Ehr.; *T. lineare* Penard; *T. campfanatum* Penard.

The genus represented by *T. enchelys* is very common in many localities. The other two species were rarely observed.

Class ACTINOPODA. Subclass HELIOZOA.

Order APHROTHORACIDA.

Actinophrys Ehrenberg. *A. sol* Ehr.

Observed in great abundance at Kyoto; rarely seen in other localities.

The following list is a record of the species of Mastigophora and Infusoria identified in material taken from the fresh waters of Japan. Flagellates and ciliates are very abundant in that country, as elsewhere, and the small number of species here listed indicates brevity of observation rather than any dearth in protozoan fauna. The remarkable thing to be noticed is the identity of the Japanese forms with our common American species.

Subphylum MASTIGOPHORA:

Class ZOOMASTIGOPHORA.

Order HETEROMASTIGOPHORA.

Notosolenus Stokes. *N. orbicularis* Stokes.

Anisonema Dujardin. *A. acinus* Duj.

Order MONADIDA.

Anthophysa Bory d. St. Vincent. *A. vegetans* Müll.

Order EUGLENIDA.

Euglena Ehrenberg. *E. viridis* Ehr.; *E. deses* Ehr.; *E. acus* Ehr.

Phacus Dujardin. *P. pleuronectes* Müll.; *P. longicaudus* Ehr.

Trachelomonas Ehrenberg. *T. hispida* Stein; *T. volvocina* Ehr.; *T. armata* Stein.

Astasia Ehrenberg. *A. trichophora* Ehr.

Distigma Ehrenberg. *D. proteus* Ehr.

Subphylum INFUSORIA :**Class CILIATA.****Order HCLOTRICHIDA.**

- Coleps* Ehrenberg. *C. hirtus* Ehr.
Lacrymaria Ehrenberg. *L. olor* Müll.
Lionotus Wrzesniowski. *L. fasciola* Ehr.
Dileptus Dujardin. *D. gigas* C. and L.
Chilodon Ehrenberg. *C. cucullulus* Müll.
Nassula Ehrenberg. *N. oronata* Ehr.
Loxocephalus Ehrenberg. *L. granulosus* Kent.
Cinetochilum Perty. *C. margaritaceum* Ehr.
Frontonia Ehrenberg. *F. leucas* Ehr.
Paramaecium Müller. *P. caudatum* Ehr.; *P. bursaria* Ehr.
Cyclidium Ehrenberg. *C. glaucoma* Ehr.
Pleuronema Dujardin. *P. sp.* (undetermined).

Order HETEROTRICHIDA.

- Spirostomum* Ehrenberg. *S. ambiguum* Ehr.
Stentor Oken. *S. caeruleus* Ehr.; *S. polymorphus* Ehr.
Gyrocoris Stein. *G. oxyura* Stein.

Order HYPOTRICHIDA.

- Oxytricha* Ehrenberg. *O. pellionella* Müll.
Stylonychia Ehrenberg. *S. notophora* Stokes.
Euplotes Ehrenberg. *E. charon* Müll.
Aspidisca Ehrenberg. *A. costata* Duj.

Order PERITRICHIDA.

- Vorticella* Linnaeus. *V. sps.*

A number of undetermined species were observed.

Cothurnia Ehrenberg. *C.* sp. (undetermined).

Class SUCTORIA.

Sphaerophrya Claperède and Lachmann. *S. magna* Maupas.

Washburn College, Topeka, Kansas.

Explanation of Figures.

PLATE VIII.

- Fig. 1, *Lecquereusia spiralis* Ehrenberg; $\times 272$. From Lake Hakone.
- Fig. 2, *Lecquereusia spiralis* Ehrenberg; $\times 257$. From Lake Hakone.
- Fig. 3, *Lecquereusia spiralis* Ehrenberg; $\times 272$. From Lake Hakone.
Variations of the species common in Japan.
The aperture is directed almost straight.
- Fig. 4, *Lecquereusia modesta* Rhumbler; $\times 225$. From Lake Chuzenji.
- Fig. 5, *Diffugia bacilliarum* Perty; $\times 225$. From Lake Hakone.
- Fig. 6, *Diffugia elegans* Penard; $\times 195$.
Very common. Individuals observed ranged from 60–194 μ in length.
- Fig. 7, *Quadrullella symmetrica* var. *curvata* Wailes; $\times 427$.
Near the aperture the plates become small and irregular.
Rarely observed. From Mt. Rokkozan.
- Fig. 8, *Nebela hippocrepis* Leidy; $\times 198$.
Broad view of a shell. From Mt. Rokkozan.
- Fig. 9, *Nebela hippocrepis* Leidy; $\times 198$. Narrow view of same.
- Fig. 10, *Nebela triangulata* Lang; $\times 325$.
Broad view of a shell. From Lake Hakone.
- Fig. 11, *Nebela triangulata* Lang; $\times 378$. From Lake Hakone.
- Fig. 12, *Nebela triangulata* Lang; $\times 354$. From Lake Hakone.
- Fig. 13, *Nebela triangulata* Lang; $\times 315$. From Lake Hakone.
- Fig. 14, *Nebela triangulata* Lang; $\times 325$. Narrow view of a shell.
From Lake Hakone.
Variation in the shape of the fundus and in the arrangement of the plates shown in these figures.
- Fig. 15, *Campascus dentatus*, sp. nov.; $\times 370$.
Broad view of a shell with the posterior border of the fundus

provided with numerous teeth-like prolongations. From Lake Hakone.

Fig. 16, *Campascus dentatus*, sp. nov.; $\times 370$. Broad view of another shell. From Lake Hakone.

Fig. 17, *Campascus dentatus*, sp. nov.; $\times 390$. Broad view of another shell. From Lake Hakone.

Fig. 18, *Campascus dentatus*, sp. nov.; $\times 390$. Narrow view of same. From Lake Hakone.

Fig. 19, *Paulinella chromatophora* Lauterborn; $\times 1050$. From Lake Hakone.

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On the Development of some Japanese Echinoderms.

Preliminary Notice.

By

Dr. Th. Mortensen.

One of the foremost objects of my recent visit to Japan and other places in the Pacific was to study the development of as many different species of Echinoderms as possible with the view of making a comparative study of the larval forms, in order to see if there is any real interrelation between the shape and structure of the larvæ and the natural relationship of the grown-up forms of Echinoderms. Should it prove to be a rule that within an order or family the larvæ all possess certain characters in common, one may be justified in drawing conclusions from the characters of the larvæ as to the relationship of the mature forms, and thus obtain certainty in cases where doubt reigns as to the natural position of these.

This is exactly the case with some common Japanese Echini.

I may recall the fact that I have in my "Ingolf" Echinoidea (I) made a complete rearrangement of several groups of Echini, both families and genera, e.g. the genera *Echinus* and *Strongylocentrotus*, to which were previously referred a great number of species, which, according to my views, ought to be referred not only to different genera but even to different families. I thus maintained that the species *Strongylocentrotus tuberculatus* and *depressus* are no true *Strongylocentrotus*, but that the former belongs to the genus *Toxocidaris* of the family *Echinometridæ*, and the latter to a separate genus, *Pseudocentrotus*,

of the family *Toxopneustidæ*. On the other hand, I maintained that another common Japanese sea-urchin, *Sphærechinus pulcherrimus*, is no *Sphærechinus* at all, but a true *Strongylocentrotus*.—As regards the position of the genus *Strongylocentrotus*, I was somewhat in doubt, thinking it most probably to form a subfamily of the *Toxopneustidæ*.

These conclusions, arrived at mainly from a comparative study of the pedicellariæ of these forms, have not met with a complete approval. While they were in the main accepted by Döderlein, another authority on recent Echinoids, H. L. Clark, is for the main part strongly opposed to them.—I shall, of course, not enter into details here, the more so, since I have at present no access at all to the necessary literature.—I was then naturally very anxious to study the development of these three forms, in order to see if any deductions could be made from the shape and structure of their larvæ.

While I have got the complete development of *Toxocidaris tuberculatus* and nearly so of *Strongylocentrotus pulcherrimus*, I could not obtain the development of *Pseudocentrotus depressus*, because its sexual products were not ripe yet at the time I had to leave Japan. But the first two, I am very satisfied to say, proved to be in accordance with my views.

Strongylocentrotus pulcherrimus.—The larva of this species is in its younger stages very much alike to that of *Strong. droebachiensis*. The body skeleton consists of a long club-shaped rod, the posterior end of the body being thus elongated, as is the case in the larvæ of *Strong. droebachiensis* and of true *Echinus* species. This fact induces me to think that, in reality, *Strongylocentrotus* is nearly related to the *Echinidæ* s. str. and not to the *Toxopneustidæ*, in which latter family the larvæ have quite another shape, viz. a short body with a complicated body-skeleton forming a peculiar frame. So it is at all events in *Sphærechinus granularis* and—as I have been able to ascertain here in Japan—also in *Toxopneustes pileolus*. I should be very much surprised if the same does not prove to hold good for *Pseudocen-*

trotus depressus; but this point must be left to one of my Japanese colleagues to ascertain.

In the later stages of *Strong. pulcherrimus*-larvæ, the long body rods are resorbed and the body shortened, just as in *Echinus* larvæ. (It is with purpose that I do not say 'as in *Strong. droebachiensis* larvæ.' It is true Agassiz has described the complete development of this species, but, as I have already shown in my first paper on Echinoderm-larvæ [„Die Echinodermenlarven d. Plankton-Expedition"], he has there confounded other larvæ with those of that species). In the latest stages reached, the larvæ had just begun to show signs of approaching metamorphosis; but vibratile epaulettes had not yet formed. If they form at all in this species is a question I am sorry I must leave undecided. (In the larva of *Strong. droebachiensis* there are epaulettes; I can say this, having obtained some larvæ in Plankton samples from Greenland, where no other Echinoid occurs, making the correctness of the identification of those larvæ beyond the reach of doubt). The rods of the processes are all simple, not fenestrated.

Toxocidaris tuberculatus.—The larva of this species is quite different in body shape and in the structure of skeleton from that of *Str. pulcherrimus*. In the first stage it is similar to that of *Toxopneustes pileolus*: the body is short, and the skeleton of the body forms a frame, the rods being very strongly thorny. In a later stage, a posterior cross-rod is developed, ending in two very peculiar postero-lateral rods, which are strongly thorny

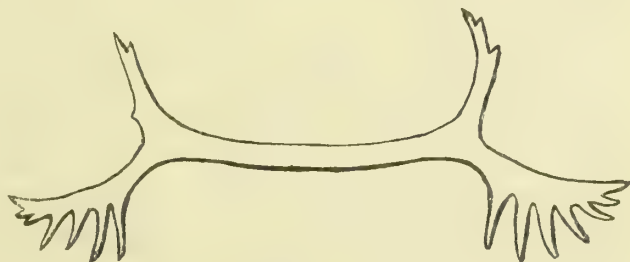


Fig. 1.—Posterior cross-rod and postero-lateral rods of the larva of *Toxocidaris tuberculatus*. $\frac{300}{1}$

and look somewhat like the antlers of a stag (Fig. 1). The rods of the postoral and the postero-dorsal processes are fenestrated. There are four vibratile lobes, but no epaulettes.

It is evident that this larva does not suggest any relationship with that of *Strong. pulcherrimus*. On the other hand, my conclusion that *Toxocidaris* belongs to the *Echinometridæ* gets, for the present, no support from the structure of the larva. No Echinometrid-larva is known with certainly as yet. I have described in the „Festschrift für Spengel” a very curious larva from the West Indies, with a pair of extremely long lateral processes, which larva I think must be referred to *Echinometra lucunter*. It is certainly very different from that of *Toxocidaris tuberculatus*. But so long as we know so very little of larvæ within the family *Echinometridæ*, it is of course impossible to draw any conclusion from the shape of its larva against the position of *Toxocidaris* within that family.

Temnopleuridæ.—Hitherto there was not known any Temnopleurid-larva. I was therefore very satisfied in getting the opportunity of rearing the larvæ of three different Temnopleurids, viz. *Temnopleurus toreumaticus*, *Pleurechinus* sp. and *Mespilia globulus*. They all agree in the structure of body skeleton: the main rod has a median process off the posterior end of the stomach, and beyond this process there is a short prolongation, which becomes absorbed in the later stages. The postoral and postero-dorsal rods are fenestrated.

These larvæ tend to show that there is a special type of larva within the family of *Temnopleuridæ*, characterized mainly by its body skeleton. As might be expected, they differ from one another in several minor points; but I cannot enter here on these details. The larva of *Mespilia* is one of the most beautiful larvæ of Echinoderms known to me. The four main processes are very wide, with epaulettes across their base; there is a posterior cross-rod, ending in small branching postero-lateral rods. Of the two other forms I have

not got the larvæ sufficiently advanced in development to ascertain whether or not they have a posterior cross-rod and postero-lateral processes.

Of the *Spatangoidea* I have succeeded in getting ripe material of only one species, *Brissus Agassizi*. Owing to the lateness of the season when I got that material, the larvæ did not reach their final shape before I had to leave Japan. The postero-lateral rods, in which the specific characters of Spatangoid-larvæ are mainly found, have not yet developed, so that the main character of this larva cannot be given. The larva is, otherwise, of the form typical to Spatangoids. The posterior process is rather short; the rods of this process as well as those of postoral and postero-dorsal processes are fenestrated in their whole length.

The *Clypeastroidea* yielded considerably better results. The larvæ of four species were reared, viz. *Clypeaster japonicus*, *Mellita japonica*,¹⁾ *Laganum decagonale* and *Laganum fudsiyama*.

It may first be pointed out that these larvæ all agree with those of other Clypeastroids hitherto known in their skeletal structure and general shape. There is no necessity for giving here further details as regards the larvæ of *Clypeaster* and *Mellita*. It may be enough to say that in the *Clypeaster*-larva the body skeleton is quite smooth, with some branches at the lower end of the frame, while the *Mellita*-larva is very similar to that of the *Mellita* from the Atlantic coast of North America. *Laganum fudsiyama*²⁾ affords special interest in that it is a deep-water species; I have got it from depths of 200-800 meters. This is the first time that an Echinoderm from the deeper water was studied as regards its development.

1) This species is designated in *Yoshiwara's* Monograph of the Japanese Echinoidea as *Astricypus Manni*. Having no access to literature at present, I do not venture to say that this is an error; but anyhow I do not see why this should not be a *Mellita*, and if I remember correctly, there is a *Mellita japonica*.

2) Possibly this is really *Laganum pellucidum*; but I have not been able to decide the point for want of literature.

It is interesting to note that it has quite typically pelagic larvæ of the common Clypeastroid shape. As it was only during the last days of my stay in Misaki that I got the ripe material of this species, I naturally have succeeded only in getting the first stages of the larva.

I should take the occasion here to mention that, while in general I think that deep-sea Echinoderms have no pelagic larvæ but undergo more or less direct development, there exist—perhaps only among the archibenthal forms, and not among those from very deep waters—some that have pelagic larvæ. Thus, I venture to maintain from the small size of the eggs, that a small species of *Orechinus* (?) which I have got from the Sagami Sea, will, like the *Laganum* mentioned above, prove to have pelagic larvæ. The same I should think will hold good also for *Salenia pacifica*, *Hemipedina* a.o. Unfortunately I could not get sufficient material of these forms for studying their development.

Laganum decagonale proved to be especially interesting as regards its development. The eggs are comparatively large, measuring nearly 0.5 mm. in diameter, and are yolky, in accordance with which fact the development is shortened, the whole metamorphosis being accomplished in the course of only 3–4 days. The larvæ are pelagic, but very much reduced in organization. Generally they have only two processes, the postoral ones; more rarely a pair of postero-dorsal processes are found. For the rest they are very variable as to their shape. The two postoral processes may have coalesced, so that they appear like one single process, and instead of the two postero-dorsal processes there may be only one. In fact, we may find the larvæ having one, two, three or four processes, or even none at all; but the metamorphosis goes on just the same, whatever may be the number of processes developed. (Fig. 2). There is no vibratile chord, but a general ciliation of the whole body. The larval intestine is rudimentary; the mouth opening is very small and there appears to be no anal opening. Evidently the larva does not take any food, but subsists on the yolk

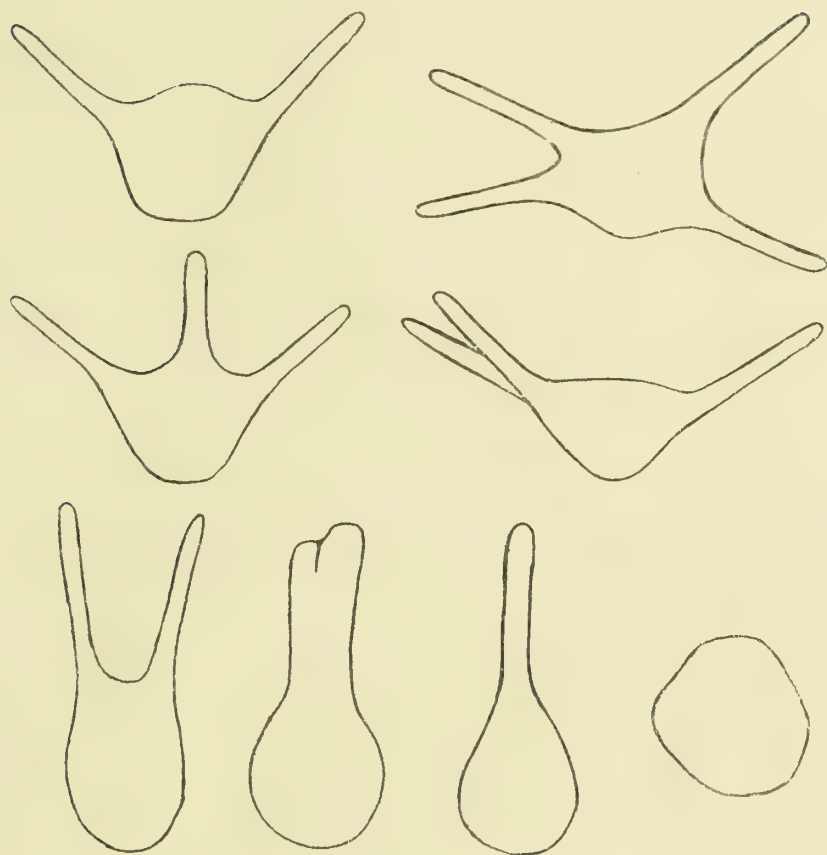


Fig. 2.—Sketches showing the variation in shape of the larva of *Laganum*
decagonale. $\frac{75}{1}$

of the egg. The larval skeleton is, of course, rudimentary, but is otherwise in accordance with the typical skeletal structure of Clypeastroid-larvæ.

It is worth pointing out that, in spite of the large size of the eggs, the cleavage is total and quite regular. A feature not hitherto seen in Echinoids, if I remember aright, is that the embryo in the blastula stage, before it leaves the egg-membrane, has the ectoderm strongly folded, much as it occurs in some starfishes (*Luidia* a.o.). The forma-

tion of the entoderm takes place not as a real invagination, but more as a strong growth of cells at the oral end, and there is no gastrula mouth. The formation of the enterocoel could not be seen in the living embryos on account of their intransparency; sections are necessary for studying the whole inner transformation.

By putting some sand in the dishes, wherein I kept these larvæ, and thus giving them a natural substrate, I succeeded in keeping the metamorphosed young sea-urchins alive for some time; when this was not done, they perished very soon, assuming the green colour so characteristic of the dying tissue of Clypeastroids.

Asteroidea.—I have succeeded in getting the complete development of *Asterina pectinifera* and *Astropecten scoparius*, and the younger developmental stages of *Astropecten polyacanthus* and *Asterias calamaria*.¹⁾

Asterina pectinifera.—A special interest is attached to the development of this species. The only species of *Asterina*, the development of which was hitherto known, is the common European species, the almost classical *Asterina gibbosa*, which has large eggs and non-pelagic larvæ. *Asterina pectinifera* has small eggs, which develop into typical pelagic larvæ. In the younger stages the larva looks very much like an *Astropecten*-larva; the preoral vibratile chord is well developed also at the apical end—a character that I have thought to be peculiar to those larvæ which have no Brachiolaria-stage. I was therefore rather surprised in seeing that this larva has a Brachiolaria-stage. The paired Brachiolarian processes are small, with a few papillæ at the end; the median process is of the type having papillæ along the edges. The sucking disk is rather large and distinct. For the rest the larva is small and inconspicuous, without colouration. The postero-lateral processes are small and non-contractile.

1) I am indebted to Professor S. Goto for the specific names of these Asterooids.

The larvæ of the two *Astropecten*-species are of the typical form, and there is no reason for giving their special characters in this preliminary notice.

Asterias calamaria at first puzzled me somewhat. In the younger stages it undergoes autotomy and apparently does not propagate sexually. Nearly all the larger specimens opened contained genital organs with large, white, biserially arranged eggs of an oval shape. Having at length found a few specimens with ovaries of the usual Asteroid-structure, I realized that the organs, at first taken for the ovaries of the starfish, belonged to a parasite, most probably a Cirripedian, like that known from other starfishes. I have not, however, succeeded in finding any specimen with the eggs of the parasite so far advanced in development that their real nature could be ascertained.

It was only in the last days of my stay at Misaki that I got a few specimens of this starfish with nearly ripe gonads, and only a few of the eggs were quite ripe. I succeeded in getting some few eggs fertilized and in rearing larvæ only to their first stages. The specific characters of the larva I can not give; I can not even state definitely whether it has a Brachiolarian-stage. However, there is all reason to expect that it has that stage, like the other species of this genus of which the development has been studied.

Of Ophiurans and Holothurians I could not get sufficient ripe material, but only sometimes a ripe male and sometimes a ripe female. Once only I had rich material of an *Ophiothrix* from deep water, which shed its eggs and sperm of itself. Some of the eggs were fertilized and isolated, but unfortunately they did not develop.

Of one species of Comatulids, occurring at the rocky shores close to the station, I got the pentacrinoid stages in a fairly complete series; but a closer study of this form must be left till my return home.

Altogether the development of no less than 16 species of Echinoderms has been studied, more or less completely, during my three months' stay at the marine laboratory at Misaki.

In conclusion I beg to tender herewith my most sincere thanks to my Japanese colleagues, especially to Professor Ijima, for the very kind reception given to me.

The China Sea, on board S.S. "Nikko Maru."

July 26th, 1914.

Notes on a Collection of Termites from the East Indian Archipelago.

By

Masamitsu Oshima

Institute of Science, Government of Formosa.

With Plates IX and X.

In the present paper is given a record of two collections of termites. The first was obtained by Mr. Ryoza Kanehira, expert of the Experimental Forestry Station of the Government of Formosa, during his tour to the Malayan Archipelago in the spring of 1913. The second was obtained at Los-Banos, Luzon, by Prof. C. E. Baker, of the University of the Philippines.

The interest of these collections resides not only in the large number of new species they reveal, but also in presenting localities new to the termite collector. I have referred the specimens to the following twenty-four species, of which nineteen seem to be new to science:

1. *Coptotermes dobonicus* n. sp.
2. *Coptotermes travians* (Hav.).
3. *Coptotermes bornensis* n. sp.
4. *Coptotermes menadoensis* n. sp.
5. *Coptotermes flavicephalus* n. sp.
6. *Coptotermes hongkonensis* n. sp.
7. *Parrhinotermes inæqualis* (Hav.).
8. *Rhinotermes* (*Schedorhinotermes*) *longirostris* (Brauer).
9. *Rhinotermes* (*Schedorhinotermes*) *tavakanensis* n. sp.
10. *Termes* (*Macrotermes*) *manilanus* n. sp.
11. *Termes* (*Macrotermes*) *philippinensis* n. sp.

12. *Termes* (*Macrotermes*) *luzonensis* n. sp.
13. *Termes* (*Termes*) *Copelandi* n. sp.
14. *Odontotermes* (*Odontotermes*) *celebensis* n. sp.
15. **Eutermes* (*Hirtitermes*) *spinocephalus* n. sp.
16. *Eutermes* (*Eutermes*) *buitenzorgi* Holmgr.
17. *Eutermes* (*Eutermes*) *doboensis* n. sp.
18. *Eutermes* (*Eutermes*) *sandakanensis* n. sp.
19. *Eutermes* (*Sublittermes*) *Kanchiræ* n. sp.
20. *Eutermes* (*Tumulitermes*) *boetoni* n. sp.
21. *Eutermes* (*Trinervitermes*) *menadoensis* n. sp.
22. *Eutermes* (*Grallatotermes*) *luzonicus* n. sp.
23. *Microcerotermes* *los-banosensis* n. sp.
24. *Microcerotermes* *distans* (Hav.).

Here I express my sincere thanks to Prof. Baker and Mr. Kanchira, both of whom very kindly forwarded to me the interesting materials for examination.

The classification adopted in the following is that of Holmgren.

Family MESOTERMITIDÆ.

Subfamily COPTOTERMITINÆ.

Genus *Coptotermes* Wasmann.

1. *Coptotermes dobonicus* nov. sp.

(Pl. IX., fig. 3).

Imago unknown.

Soldier.—Head pale yellow; mandible brown; abdomen whitish. Head sparingly pilose; abdominal tergites densely provided with delicate hairs.

Head ovoid, slightly flattened; orifice of fontanelle directed for-

ward, somewhat inclined; basal portion of clypeus short; labrum tongue-shaped, with hyaline, triangular tip, reaching beyond middle of mandibles; mandibles sabre-shaped, with incurved piercing tip; antennæ 17-jointed, 3rd joint shorter than 2nd; pronotum broad, anterior and posterior borders indented in the middle.

Length of body 6,00 mm.

Length of head with mandible.. .. . 2,69 mm.

Length of head without mandible 1,66 mm.

Width of head 1,41 mm.

Width of pronotum 1,06 mm.

Length of pronotum 0,59 mm.

Worker.—Head and abdomen whitish; head stout; antennæ 16-jointed, 2nd joint as long as 3rd; anterior border of pronotum slightly indented in the middle, posterior border rounded.

Length of body 6,00 mm.

Width of head 1,47 mm.

Width of pronotum 0,91 mm.

Habitat.—Dobo, Arue Island (Dutch New Guinea); collected by Mr. Kanehira on May 6, 1913.

Remarks.—This species is closely allied to *Coptotermes curvignathus* Holmgren. However, a close comparison of the two species shows several discrepancies. Thus, in *C. dobonicus* the soldier is provided with much longer head and with antennæ which are 17-jointed instead of being 14–16-jointed. In the workers, the most notable difference lies in the number of antennal joints, which in the present species number 16, the 2nd joint being as long as the 3rd, while in *C. curvignathus* the antennæ are 15-jointed, the 2nd joint being much longer than the 3rd.

2. *Coptotermes travians* (Haviland).

Soldier.—Head yellow; mandibles brown; abdomen whitish. Head sparingly pilose; abdominal tergites densely provided with subequal hairs.

Head oval, slightly vaulted dorsally, sides converging anteriorly; fontanelle tube-shaped, large, its orifice directed forward, reaching beyond the basal portion of clypeus; basal portion of clypeus very short; labrum triangular, with hyaline tip, reaching to middle of mandibles; antennæ 14-jointed, 3rd joint as long as 2nd; submentum contracted very weakly in the middle; pronotum slightly longer than half the width, anterior border distinctly indented in the middle, posterior border slightly emarginate at middle.

Length of body	4,50 mm.
Length of head with mandible	2,03-2,09 mm.
Length of head without mandible	1,31-1,34 mm.
Width of head	1,09-1,16 mm.
Width of pronotum	0,81 mm.
Length of Pronotum	0,44 mm.

Habitat.—Tarakan, Dutch Borneo; collected by Mr. Kanehira on May 23, 1913.

3. *Coptotermes bornensis* nov. sp.

(Pl. IX., Fig. 2).

Imago unknown.

Soldier.—Head yellow, darker anteriorly; mandibles brown. Head and abdominal tergites densely provided with delicate hairs, the latter without special series of spiny hairs.

Head oval, vaulted dorsally, sides slightly converging anteriorly; fontanelle directed forward; basal portion of clypeus very short; labrum triangular, apex hyaline, scarcely reaching to middle of mandibles; antennæ 13-jointed, 2nd joint longer than 3rd, 4th joint as long as 3rd; submentum strongly contracted in the middle; pronotum slightly longer than half the width, anterior border strongly indented in the middle, posterior border slightly emarginate at middle; dorsal surface of abdomen with two longitudinal dark bands.

Length of body	4,00 mm.
Length of head with mandible	1,94 mm.
Length of head without mandible	1,34 mm.
Width of head	1,00 mm.
Width of pronotum	0,75 mm.
Length of pronotum	0,41 mm.

Worker.—Head pale yellow; abdomen whitish. Head provided with delicate hairs; hairs on abdominal tergites longer and subequal.

Fontanelle indistinct; basal portion of clypeus short, slightly swollen; antennæ 13-jointed, 2nd joint longer than 3rd; pronotum rather smaller, anterior border considerably emarginate at middle, posterior border rounded.

Length of body	4,00 mm.
Width of head	0,97 mm.
Width of pronotum	0,66 mm.

Habitat.—Balik-Papan, Dutch Borneo; collected by Mr. Kanehira on April 20, 1913.

Remarks.—This species is closely related to *Coptotermes travians* (Haviland). But in the soldier of *C. bornuensis* the contraction in the middle part of submentum is markedly stronger than in *C. travians* and the antennæ are 14-jointed instead of being 13-jointed. With the workers alone on hand, I have found it scarcely possible to draw a fast line between the two species.

4. *Coptotermes menadoensis* nov. sp.

Soldier and worker unknown.

Imago.—Body yellowish brown; clypeus, antennæ, legs, and the ventral side of abdomen straw-colored; mandibles reddish brown, apex darker; wings hyaline, outer border yellowish. Head densely provided with spiny hairs; along the posterior border of abdominal tergites two series of hairs, of which the anterior ones are the shorter.

Head rounded; fontanelle indistinct, dotted, slightly swollen;

transversal band longer in the middle than in sides; forehead inclined; basal portion of clypeus very short, slightly swollen; eyes somewhat prominent; ocelli approximated to eye; antennæ 22-jointed, 2nd joint slightly longer than 3rd, 4th joint twice as long as 3rd; pronotum longer than half the width, anterior border broadly concave, posterior border weakly indented in the middle; mesonotum and metanotum considerably narrower than pronotum, their posterior border slightly emarginate at middle; anterior wing-stumps much larger than the posterior wing, covering the basal parts of the latter; membrane of the wings densely provided with hairs; median nerve runs near to cubitus, branched in apical area; cubitus with ca. 7 branches, of which the proximal ones are the stronger.

Length of body with wings. 14,00–16,50 mm.

Length of anterior wing 11,00–12,00 mm.

Length of body 6,50– 8,00 mm.

Length of head 1,34 mm.

Width of head 1,41– 1,50 mm.

Width of pronotum 1,53– 1,66 mm.

Length of pronotum 0,94– 1,03 mm.

Habitat.—Menado, Celebes; collected by Mr. Kanehira on May 15, 1913.

5. *Coptotermes flavicephalus* nov. sp.

(Pl. IX., fig. 1).

Imago unknown.

Soldier.—Head pale yellow; mandibles brown; abdomen straw-coloured. Head sparingly pilose; abdominal tergites densely provided with hairs.

Head suborbicular, broad and flattened; fontanelle directed forward; basal portion of clypeus short; labrum tongue-shaped, with pointed tip, scarcely reaching to middle of mandibles; mandibles with strongly incurved tip; antennæ 15-or 16-jointed, 3rd joint nearly as

long as 2nd; pronotum broad, anterior and posterior borders indented in the middle.

Length of body	6,00-6,50 mm.
Length of head with mandible	2,75 mm.
Length of head without mandible	1,63 mm.
Width of head	1,53 mm.
Width of pronotum	1,03-1,09 mm.
Length of pronotum	0,63 mm.

Worker.—Head yellowish white; abdomen whitish. Head sparingly pilose; abdominal tergite moderately provided with subequal hairs.

Antennæ 15-jointed, 3rd joint shorter than 2nd; anterior border of pronotum distinctly indented in the middle, posterior border straight.

Length of body	5,00 mm.
Width of head	1,44 mm.
Width of pronotum	0,78 mm.

Habitat.—Los-Banos, Luzon; collected by Prof. Baker.

Remarks.—The present species is very closely allied to *Coptotermes curvignathus* Holmgren. But the head of soldier is much larger and the pronotum of same is broader.

6. *Coptotermes hongkonensis* nov. sp.

(Pl. IX., fig. 5).

Imago unknown.

Soldier.—Head pale yellow; mandibles brown; abdomen milk-white. Head sparingly pilose; abdominal tergites with dense, subequal hairs, no series of spiny hairs.

Head oval, slightly flattened, sides considerably converging anteriorly; fontanelle directed forward; basal portion of clypeus short; labrum lancet-shaped, tip pointed, not hyaline, scarcely reaching to middle of mandibles; mandibles saber-shaped, slender; antennæ 15-jointed, 3rd joint minute, half as long as 2nd; submentum slightly

contracted at middle; pronotum considerably longer than half the width, anterior and posterior border indented in the middle.

Length of body	4,50 mm.
Length of head with mandible	2,16 mm.
Length of head without mandible	1,28-1,34 mm.
Width of head	1,09 mm.
Width of pronotum	0,75 mm.
	0,44 mm.

Worker.—Head yellowish; abdomen straw-colour. Head and abdominal tergites provided with delicate hairs, those on the latter longer.

Head quadrate, its posterior border rounded; basal portion of clypeus longer than half the width; fontanelle and sutures of head indistinct; antennæ 14-jointed, 2nd joint longer than 3rd; pronotum much narrower than head, anterior and posterior border indented at middle.

Length of body	4,00 mm.
Width of head	1,25 mm.
Width of pronotum	0,72 mm.

Habitat.—Hongkong; collected by Mr. Herper in 1910.

Remarks.—*Coptotermes hongkonensis* is a species closely agreeing with *C. travians* (Haviland) and *C. dobonicus* Oshima. However, it differs from the former in the number of antennal joints and the length of head in soldiers, and from the latter in the number of antennal joints as well as in the degree of contraction of the middle of submentum in the soldiers. *Coptotermes Gestroi* Wasmann (not of Haviland) is still another nearly allied species, but the soldier has broader head and the abdominal tergites are provided with a series of spiny hairs along the posterior border.

Subfamily RHINOTERMITINÆ.

Genus *Parrhinotermes* Holmgren.7. *Parrhinotermes inæqualis* (Haviland).

(Pl. X., fig. 1).

Soldier.—Head brownish yellow; basal portion of mandible yellow, apical portion brown; abdomen straw-colour. Head very sparingly pilose; abdominal tergites provided with a series of hairs along the posterior border; submentum densely pilose.

Head stout, flattened, posterior border straight, sides converging anteriorly; fontanelle round and minute, a shallow groove running from it to apex of labrum and giving two branches to the condyle of mandible around basal part of clypeus; basal portion of clypeus short, flattened; labrum quadrangular, as long as broad, apical third hyaline, apex obtuse, provided with a cluster of short coarse hairs; mandibles stout, with elongated and slender apical portion, proximal portion broad; left mandible provided with two teeth, of which the first one is larger than the second and is leaf-shaped, while the latter is somewhat triangular, short, its tip directed forward, and has the median portion of masticating border distinctly serrated; right mandible provided with a triangular tooth, with obtuse tip, the basal portion of masticating border serrated; antennæ 13-jointed, 3rd joint longer than 2nd; pronotum minute, anterior border convex, posterior border slightly concave.

Length of body	4,50 mm.
Length of head with mandible.. .. .	2,03 mm.
Length of head without mandible	1,47 mm.
Width of head	1,28 mm.
Width of pronotum	0,72 mm.
Length of pronotum	0,38 mm.

Worker.—Head pale yellow; abdomen yellowish white. Head densely provided with hairs; abdominal tergites moderately pilose.

Head quadrangular, with rounded posterior border, much broader than long; fontanelle indistinct; basal portion of clypeus flat, short; labrum strongly inclined downwards; antennæ 13-jointed, 3rd joint as long as 2nd; pronotum saddle-shaped, anterior border scarcely indented at middle; mesonotum and metanotum broader than pronotum.

Length of body 3.50 mm.

Width of head 1.00 mm.

Width of pronotum 1.78 mm.

Habitat.—Balik-Papan, Dutch Borneo; collected by Mr. Kanchira on April 21, 1913.

Genus *Rhinotermes* Hagen.

8. *Rhinotermes* (*Schedorhinotermes*) *longirostris* (Brauer).

(Pl. X., figs. 3-4).

Soldier (larger form).—Head yellow; mandibles brown; abdomen straw-colour. Body sparingly provided with hairs.

Posterior part of head quadrangular, sides of the anterior half abruptly converging anteriorly; fontanelle distinct, directed upwards, situated between antennal fossa; from the fontanelle runs a shallow groove, reaching to apex of labrum, widening anteriorly; clypeus grooved along the median line, boundary between apical and basal portions indistinct, the former whitish; labrum tongue-shaped, longer than broad, apical part two-lobed, sparingly provided with hairs, reaching beyond tip of mandible; mandibles stout, the left provided with two teeth, the right with one tooth; antennæ 16-jointed, 2nd joint as long as 3rd, 4th joint half as long as 3rd; pronotum flat, anterior border convex, posterior border slightly emarginate at middle; mesonotum shorter and narrower than pronotum; metanotum much broader than pronotum; abdomen flattened, broad and short.

Length of body	4,50 mm.
Length of head with mandible.. .. .	2,09 mm.
Length of head without mandible	1,34 mm.
Width of head	1,38 mm.
Width of pronotum	0,75 mm.
Length of pronotum	0 44 mm.

Soldier (smaller form).—Head pale yellow; mandibles light brown; abdomen straw-colour. Head sparingly pilose; abdominal tergites provided with a series of longer spiny hairs.

Head slightly vaulted dorsally, with rounded posterior border, sides of anterior part abruptly converging anteriorly; fontanelle round with a deep groove running from it to tip of labrum; forehead strongly inclined; clypeus tongue-shaped, swollen on both sides of the median groove, apical part whitish; labrum rectangular, much longer than broad, reaching beyond tip of mandibles, median groove deep, widened anteriorly, tip two-lobed, whitish, its outer border with dense hairs, the dorsal surface sparsely provided with hairs; mandibles slender, tip abruptly incurved, the left provided with two teeth, the right with one; antennæ 15-jointed, 2nd joint twice as long as 3rd; pronotum minute, with convex anterior and straight posterior border; mesonotum as broad as pronotum; metanotum broader than pronotum.

Length of body	3,20 mm.
Length of head with mandible.. .. .	1,34 mm.
Length of head without mandible	0,81 mm.
Width of head	0,75 mm.
Width of pronotum	0,50 mm.
Length of pronotum	0,34 mm.

Worker.—Head yellowish white; abdomen whitish. Head slightly covered with hairs; abdominal tergites with two irregular series of spiny hairs.

Head quadrate, posterior border rounded; fontanelle indistinct;

basal portion of clypeus markedly swollen; antennæ 16-jointed, 2nd joint longer than 3rd, 4th joint half as long as 3rd.

Length of body 4,20 mm.

Width of head 1,31 mm.

Width of pronotum 0,59 mm.

Habitat.—Maros, Celebes; collected by Mr. Kanehira on April 25, 1914.

9. *Rhinotermes* (*Schedorhinotermes*) *tarakanensis* nov. sp.

(Pl. X., fig. 2).

Imago and the larger form of soldiers unknown.

Soldier (smaller form).—Very closely resembling same of *R. longirostris*, but somewhat smaller.

Antennæ 14-jointed, 2nd joint as long as 3rd, 4th joint shorter than 3rd.

Length of body 2,80 mm.

Length of head with mandible 1,28 mm.

Length of head without mandible 0,75 mm.

Width of head 0,67 mm.

Width of pronotum 0,47 mm.

Length of pronotum 0,31 mm.

Worker.—Agreeing in all characters with those of *R. longirostris*, but somewhat smaller.

Antennæ 15-jointed, 2nd joint longer than 3rd.

Length of body 3,50 mm.

Width of head 1,09 mm.

Width of pronotum 0,53 mm.

Habitat.—Tarakan, Dutch Borneo; collected by Mr. Kanehira on May 23, 1913.

Family METATERMITIDÆ.

Genus *Termes* (L.) Holmgren.10. *Termes* (*Macrotermes*) *manilanus* nov. sp.

Imago.—Body chestnut brown, paler on ventral side; basal portion of clypeus yellow; the antennæ, the T-shaped patch on pronotum, the antero-lateral corners of same, the anterior border of mesonotum, and the metanotum brownish yellow; wings yellowish brown, with yellowish subcostal band. Head sparingly pilose; abdominal tergites provided with subequal hairs; labrum, pronotum, and wing-stumps densely haired.

Head broadly oval, with sides slightly converging anteriorly, somewhat flattened; eyes very large and prominent; ocelli separated from eye by a distance equal to their radius; fontanelle indistinct, slightly elevated; top of head surrounding the fontanelle somewhat depressed; basal portion of clypeus very large, shorter than half its width, markedly swollen; antennæ 19-jointed, 3rd joint slightly longer than 2nd, 4th joint shorter than 3rd; pronotum semicircular, broader than head, anterior border concave, posterior border slightly emarginate at middle; mesonotum and metanotum as broad as pronotum, their posterior border concave; membrane of wings densely covered with hairs; median nerve runs near to cubitus, starting from the wing-stump, branched in the middle area of wing, with ca. 5 branches; cubitus with ca. 10 branches, of which the proximal ones are the stronger.

Length of body with wing	27,00 mm.
Length of body without wing	14,00 mm.
Length of anterior wing	23,00 mm.
Length of head	1,88 mm.
Width of head	2,00 mm.

Width of pronotum 2,34 mm.

Length of pronotum 1,50 mm.

Habitat.—Manila, Luzon; collected by Mr. Kanehira, date unknown.

Remarks.—This species is closely allied to *Termes gilvus* Hagen, but is greatly different in the dimensions of head. Thus, in *T. manilanus* head is 1,88 mm. long and 2,00 mm. broad, instead of of 2,66 mm. long and 2,28 mm. broad as in *T. gilvus*.

11. *Termes* (*Macrotermes*) *philippinensis* nov. sp.

(Pl. IX., figs. 8–9).

Imago.—Body chestnut brown, ventral side paler; basal portion of clypeus, labrum, antennæ, the T-shaped patch on pronotum and antero-lateral corners of same brownish yellow; wings brown. Head densely pilose, short delicate hairs being intermingled with longer spiny hairs; abdominal tergites densely beset with minute hairs; wing-stumps moderately pilose.

Head round, with sides considerably converging anteriorly; eyes moderately large; ocelli separated from eye by a distance greater than their diameter; fontanelle dotted, reddish, somewhat elevated; transversal band depressed; basal portion of clypeus slightly shorter than half its width but not very short, markedly swollen; antennæ 19-jointed, 2nd joint much longer than 3rd, 4th joint as long as 3rd; pronotum nearly as broad as head, slightly shorter than half the width, nearly saddle-shaped, antero-lateral corners markedly depressed, middle of anterior and posterior border indented; basal portion of median nerve coalescent with cubitus, the former with about 4 branches in the apical portion, the latter with 10 branches, most of them forked.

Length of body with wing 26,00 mm.

Length of body without wing 13,00 mm.

Length of anterior wing	21,50 mm.
Length of head	1,50 mm.
Width of head	2,00 mm.
Width of pronotum	2,19 mm.
Length of pronotum	1,25 mm.

Soldier (the larger form).—Head reddish brown; abdomen yellowish; labrum, antennæ, and legs dark yellow. Head and abdominal tergites smooth.

Head quadrangular, sides converging anteriorly; fontanelle distinct, minute, situated in front of the centre of head; basal portion of clypeus short, posteriorly not separated from forehead; labrum tongue-shaped, with triangular hyaline tip; mandibles stout, tip slightly incurved; antennæ 17-jointed, 3rd joint slightly longer than 2nd; pronotum broad, anterior and posterior border distinctly indented in the middle; sides of mesonotum and metanotum rounded.

Length of body	9,50 mm.
Length of head with mandible	4,84 mm.
Length of head without mandible	3,28 mm.
Width of head	2,78–2,88 mm.
Width of pronotum	2,47–2,56 mm.
Length of pronotum	1,12–1,25 mm.

Soldier (the smaller form).—Head reddish brown; labrum, antennæ and legs somewhat paler; mandibles reddish brown; abdomen straw-colour. Head smooth; abdominal tergites provided with microscopically minute hairs, two or three posterior tergites with longer hairs.

Head rectangular, sides strongly converging anteriorly; fontanelle indistinct; basal portion of clypeus short, not distinctly separated from forehead; labrum lancet-shaped, with pointed hyaline tip; mandibles sabre-shaped, tip strongly incurved; antennæ 17-jointed, 2nd joint as long as 3rd, 4th joint slightly shorter than 3rd; pronotum semicircular, anterior and posterior borders weakly indented in the

middle; mesonotum considerably narrower than pronotum, sides rounded, posterior border slightly concave; metanotum as broad as pronotum, oval, posterior border straight.

Length of body 6,00-7,00 mm.

Length of head with mandible 3,68-3,75 mm.

Length of head without mandible 1,81-1,94 mm.

Width of head 1,56-1,69 mm.

Width of pronotum 1,41-1,44 mm.

Length of pronotum 0,78-0,84 mm.

Worker (the larger form).—Head reddish yellow; abdomen yellowish. Head and abdomen sparingly pilose.

Head quadrate, with rounded posterior border; basal portion of clypeus markedly swollen; fontanelle whitish, round; antennæ 18-jointed, 2nd joint nearly as long as 3rd, 4th joint half as long as 3rd; pronotum saddle-shaped, anterior and posterior border indented at middle.

Length of body 6,50 mm.

Width of head 2,60 mm.

Width of pronotum 1,09-1,19 mm.

Worker (the smaller form).—Paler and smaller. Antennæ 17-jointed; 2nd joint slightly longer than 3rd, 4th joint as long as 3rd.

Length of body 5,00 mm.

Width of head 1,31 mm.

Width of pronotum 0,91 mm.

Habitat—Los-Banos, Luzon; collected by Prof. Baker.

Remarks.—This species agrees well with *Termes* (*M.*) *gilvus* Hagen except in dimensions of head in the larger form of soldiers and workers. Moreover, in the present species, the smaller form of soldiers is provided with rectangular head while in *T. gilvus* this is of an oval shape.

12. *Termes* (*Macrotermes*) *luzonensis* nov. sp.

(Pl. IX., figs. 10-11).

Imago unknown.

Soldier (the larger form).—Head reddish brown; abdomen dark yellow. Head and abdominal tergites smooth.

Head broadly oval, posterior border rounded, sides converging anteriorly, slightly vaulted dorsally; no rudiment of eye; fontanelle situated in front of the centre of head, round, minute; basal portion of clypeus very short; labrum tongue-shaped, short, with triangular hyaline tip; mandibles short, stout; antennæ 17-jointed, 3rd joint as long as 2nd, 4th joint as long as 5th and slightly shorter than 3rd; pronotum broad, anterior and posterior border distinctly indented in the middle, anterior border convex; mesonotum oval, narrower than pronotum, posterior border slightly emarginate at middle; metanotum as broad as mesonotum, posterior border straight; sides of meso- and metanotum rounded.

Length of body 7,50-8,00 mm.

Length of head with mandible 4,13 mm.

Length of head without mandible 2,66-2,75 mm.

Width of head 2,25-2,28 mm.

Width of pronotum 1,88-1,94 mm.

Length of pronotum 1,03-1,09 mm.

Soldier (the smaller form).—Rather paler and smaller than the above larger form.

Head yellow; abdomen straw-colour. Head smooth; abdominal tergites provided with microscopical hairs, longer hairs intermingled with such in the posterior tergites.

Head broadly oval, sides slightly converging anteriorly; labrum long, slender, lancet-shaped, with obtuse hyaline tip; mandibles slender; basal portion of clypeus slightly swollen; fontanelle indistinct; antennæ 17-jointed, 2nd and 3rd joints as long as 4th; pronotum

very much narrower than head, longer than half the width, anterior and posterior border indented in the middle, the former convex; mesonotum narrower than pronotum; metanotum as broad as pronotum; sides of meso-and metanotum rounded.

Length of body	5,50 mm.
Length of head with mandible.. .. .	2,97 mm.
Length of body without mandible	1,72 mm.
Width of head	1,45 mm.
Width of pronotum	1,09 mm.
Length of pronotum	0,69 mm.

Worker.—Head yellow; abdomen straw-colour. Head and abdominal tergites sparingly provided with subequal hairs.

Head round; fontanelle spotted, whitish; basal portion of clypeus swollen; antennæ 17-jointed, 3rd joint shorter than 2nd, 4th joint as long as 3rd; pronotum saddle-shaped, provided with a median shallow longitudinal groove, anterior border strongly elevated and indented in the middle, posterior border emarginate at middle.

Length of body	4,50 mm.
Width of head	1,66 mm.
Width of pronotum	0,90 mm.

Habitat.—Los-Banos, Luzon; collected by Prof. Baker.

13. *Termes* (*Termes*) *Copelandi* nov. sp.

(Pl. IX., figs. 6-7).

Imago unknown.

Soldier (the larger form).—Head brownish red, antennæ and legs paler; abdomen dark yellow. Head smooth; abdominal tergites provided with microscopical hairs.

Head cylindrical, sides very slightly converging anteriorly; fontanelle dotted, minute, situated in the centre of head; basal portion of clypeus very short; labrum lancet-shaped, with pointed hyaline tip; mandibles short, stout; antennæ 17-jointed, 2nd joint as

long as 3rd, 4th joint slightly shorter than 3rd; pronotum broad, anterior and posterior border distinctly indented in the middle, the former slightly elevated; meso- and metanotum considerably narrower than pronotum, their lateral margins rounded, posterior borders concave.

Length of body	8,50 mm.
Length of head with mandible	4,53 mm.
Length of head without mandible	2,97 mm.
Width of head	2,56 mm.
Width of pronotum	2,03-2,19 mm.
Length of pronotum	1,09-1,19 mm.

Soldier (the smaller form).—Head yellow; abdomen straw-colour. Head smooth; abdominal tergites moderately pilose, hairs microscopical.

Head oval, sides slightly converging anteriorly; fontanelle minute; labrum lancet-shaped, elongated, with hyaline tip; antennæ 17-jointed, 2nd and 3rd joint as long as 4th; pronotum slightly narrower than head, anterior and posterior borders weakly indented at middle, the former convex.

Length of body	6,00 mm.
Length of head with mandible	3,09-3,19 mm.
Length of head without mandible	1,69-1,75 mm.
Width of head	1,47-1,56 mm.
Width of pronotum	1,12-1,22 mm.
Length of pronotum	0,72 mm.

Worker (the larger form).—Head yellow; abdomen whitish; antennæ brownish. Head sparingly pilose; abdominal tergites provided with subequal hairs.

Head round; fontanelle whitish, round; no rudiments of eye; forehead in front of fontanelle depressed; basal portion of clypeus shorter than half the width, slightly swollen; pronotum saddle-shaped; antennæ 18-jointed, 2nd joint as long as 3rd, 4th joint shorter than 3rd.

Length of body 5,00 mm.

Width of head 1,06 mm.

Width of pronotum 1,88 mm.

Worker (the smaller form).—Apical portion of clypeus whitish, its basal portion half as long as broad, markedly swollen; antennæ 17-jointed, 3rd and 4th joints subequal, considerably shorter than 2nd.

Length of body 5,00 mm.

Width of head 1,25 mm.

Width of pronotum 1,88 mm.

Habitat.—Los-Banos, Luzon; collected by Prof. Baker.

Genus *Odontotermes* Holmgren.

14. *Odontotermes* (*Odontotermes*) *celebensis* nov. sp.

(Pl. IX., fig. 12).

Imago unknown.

Soldier.—Head yellow; mandible brown, basal part paler; abdomen straw-colour. Head sparingly pilose; abdominal tergites densely provided with hairs.

Head ovoid; basal portion of clypeus short, not distinctly separated from forehead, its apical portion quadrate, short, with rounded anterior corners; labrum tongue-shaped, apex pointed, not reaching to middle of mandible; mandibles sabre-shaped, with incurved piercing tip, the left mandible provided with a sharp tooth near the middle of cutting edge, the right with a rudimental tooth in the same position; antennæ 17-jointed, 2nd joint as long as 3rd and 4th taken together; submentum rectangular, three times as long as broad, slightly converging anteriorly; pronotum narrower than head, saddle-shaped, anterior and posterior borders indented at middle, the former two-lobed, elevated.

Length of body 5,00–6,80 mm.

Length of head with mandible 2,84–3,06 mm.

Length of head without mandible	1,72-1,88 mm.
Width of head	1,50-1,66 mm.
Width of pronotum	1,00-1,13 mm.
Length of pronotum	0,59-0,72 mm.

Worker (the larger form).—Head yellow, abdomen whitish. Head sparingly provided with spiny hairs; abdominal tergites with a series of spiny hairs along the posterior border.

Head round; fontanelle indistinct; basal portion of clypeus markedly swollen; antennæ 17-jointed, 2nd joint slightly longer than 3rd; anterior border of pronotum two-lobed, slightly elevated.

Length of body	4,50 mm.
Width of head	1,47 mm.
Width of pronotum	0,84 mm.

Worker (the smaller form).—Antennæ 17-jointed, 2nd joint as long as 3rd and 4th taken together; anterior border of pronotum slightly concave at middle.

Length of body	4,00 mm.
Width of head	1,00 mm.
Width of pronotum	0,69 mm.

Habitat.—Maros, Celebes (April 25, 1913); Menado, Celebes (May 19, 1913); Talisay Island (date unknown); all collected by Mr. Kanehira.

Remarks.—In the present species, the soldiers vary greatly in the dimensions of head. But as there exist intermediate forms between extreme forms, it is impossible to draw a fast line to distinguish them into two castes.

Genus *Eutermes* Fr. Müller.15. *Eutermes* (*Hirtitermes*) *spinocephalus* nov. sp.

(Pl. X., fig. 7).

Imago unknown.

Soldier.—Head and pronotum brownish yellow; rostrum slightly darker; antennæ paler; abdominal tergite grey; sternite greyish yellow. Head, basal part of rostrum, and thorax densely provided with very strong spiny hairs; abdominal tergites with two series of stiff spiny hairs.

Head broadly oval, short; rostrum stout, markedly elongated, its anterior surface making a marked curve with the anterior surface of head; proximal part of antennæ prominent; antennæ 13-jointed, each joint elongated, 3rd joint as long as 1st and more than twice as long as 2nd, 4th joint shorter than half the length of 3rd and as long as 5th; pronotum saddle-shaped, anterior border emarginate at middle; legs slender, long; cerci strong, pointed.

Length of body 5,00 mm.

Length of head with rostrum 2,19 mm.

Length of head without rostrum 1,22 mm.

Width of head 1,00 mm.

Width of pronotum 0,53 mm.

Worker.—Coloration and hairiness as in soldier. Pronotum somewhat paler; labrum densely provided with minute hairs.

Head pentagonal, flattened, with rounded corners; sutures of head distinct, whitish; fontanelle triangular; basal portion of clypeus very short, four times as broad as long, slightly swollen; antennæ 14-jointed, 3rd joint shorter than twice the length of 2nd, 4th joint shorter than 2nd and 5th; pronotum saddle-shaped, anterior border scarcely emarginate at middle.

Length of body 5,00 mm.

Width of head 1,12 mm.

Width of pronotum 0,69 mm.

Habitat.—Tarakan, Dutch Borneo; collected by Mr. Kanehira on May 23, 1913.

Remarks.—The nearest relative of this species appears to be *Eutermes* (*H.*) *hirtiventris* Holmgren. However, the soldiers differ from those of that species in having head densely provided with spiny hairs, instead of being naked.

16. *Eutermes* (*Eutermes*) *buitenzorgi* Holmgren.

(Pl. X., fig. 13).

Imago unknown.

Soldier.—Head reddish yellow; rostrum brownish; antennæ, legs and abdominal tergites rusty yellow, shiny. Head pilose, microscopical hairs mingled with longer spiny hairs; abdominal tergites provided with short hairs, with a series of spiny hairs along posterior border.

Head stout, ovoid: rostrum conical, its anterior surface in level with surface of head, slightly swollen dorsally at junction of rostrum; antennæ 13-jointed, 3rd joint as long as 1st and longer than 2nd; pronotum saddle-shaped, anterior border weakly emarginate at middle.

Length of body 3,00 mm.

Length of head with rostrum 1,50 mm.

Length of head without rostrum 0,93 mm.

Width of head 0,97 mm.

Width of pronotum 0,50 mm.

Worker.—Head reddish brown; abdomen straw-colour; basal portion of clypeus paler. Head moderately pilose, mingling a few longer spiny hairs. Abdominal tergites provided with longer subequal hairs.

Head pentagonal, with rounded posterior border; sutures of head distinct, whitish; middle part of transversal band depressed; basal portion of clypeus shorter than half the width, considerably swollen;

antennæ 14-jointed, 2nd joint nearly as long as 4th; pronotum saddle-shaped, anterior border weakly indented in the middle.

Length of body 4.00 mm.

Width of head 1.15 mm.

Width of pronotum 0.60 mm.

Habitat.—Pengaran, Johore; collected by Mr. Kanchira on August 2, 1913.

17. *Eutermes* (*Eutermes*) *doboensis* nov. sp.

(Pl. X., fig. 12).

Imago unknown.

Soldier.—Head pale yellow; rostrum brownish; antennæ yellowish; abdomen straw-colour. Head sparingly provided with spiny hairs; abdominal tergites moderately pilose, with longer spiny hairs along posterior border.

Head spherical; rostrum conical; front surface of head in level with anterior surface of rostrum; antennæ 12-jointed, 3rd joint nearly as long as 2nd, 4th and 2nd joint subequal; pronotum saddle-shaped, anterior border concave, not emarginate.

Length of body 3.00 mm.

Length of head with rostrum 1.28 mm.

Length of head without rostrum 0.72 mm.

Width of head 0.72 mm.

Width of pronotum 0.34 mm.

Worker.—Head yellowish; abdomen whitish; anterior corners of transversal band brown; head and abdominal tergites densely provided with subequal hairs.

Head elongate-oval; sutures of head indistinct; basal portion of clypeus swollen, much shorter than half the width; antennæ 13-jointed, 2nd joint as long as 3rd; pronotum saddle-shaped, anterior border strongly elevated.

Length of body 3.00 mm.

Width of head 0.75 mm.

Width of pronotum 0.44 mm.

Habitat.—Dobo, Arue Island (Dutch New Guinea); collected by Mr. Kanehira on May 17, 1913.

Remarks.—The present species is closely allied to *Eutermes javanicus* Holmgren, but has the 3rd joint of antennæ in the soldier as long as the 2nd, instead of being equal, while the head and pronotum of the workers are much narrower.

18. *Eutermes* (*Eutermes*) *sandakanensis* nov. sp.

(Pl. X., fig. 8).

Imago unknown.

Soldier.—Very closely allied to *Eutermes havilandi* Desneax, but the head is shorter and narrower and is provided with 13-jointed antennæ, in which the 2nd joint is subequal to the 3rd, and the 4th joint longer than the 3rd.

Length of body 2.50–3.00 mm.

Length of head with rostrum 1.25 mm.

Length of head without rostrum 0.75 mm.

Width of head 0.75 mm.

Width of pronotum 0.41 mm.

Worker.—Also closely resembling same of *E. havilandi*. Antennæ 14-jointed, 3rd joint slightly shorter than the 2nd and twice as long as the 4th; anterior part of transversal band not depressed; pronotum saddleshaped, anterior border not emarginate.

Length of body 3.50 mm.

Width of head 1.00 mm.

Width of pronotum 0.56 mm.

Habitat.—Sandakan, Borneo; collected by Mr. Kanehira on August 7, 1913.

19. Eutermes (Sublittermes) Kanehira nov. sp.

(Pl. X., fig. 14).

Imago unknown.

Soldier.—Head dark brown, tip of rostrum paler; antennæ and abdomen straw-colour. Head pilose, microscopical hairs mingled with longer spiny ones, the latter very few; abdominal tergites densely provided with subequal hairs.

Head ovoid, the sides strongly converging anteriorly; rostrum cylindrical, slender, shorter than head, its anterior surface making a weak curve with the anterior surface of head; antennæ 11-jointed, 2nd joint as long as 3rd; mandibles without apical portion; pronotum saddle-shaped, short, anterior border not emarginate.

Length of body 3.00 mm.

Length of head with rostrum 1.12 mm.

Length of head without rostrum 0.75 mm.

Width of head 0.66 mm.

Width of pronotum 0.34 mm.

Worker.—Head pale yellow; abdomen whitish; anterior corners of transversal band brown. Head microscopically pilose; abdominal tergites very sparingly provided with hairs.

Head round; sutures of head indistinct; basal portion of clypeus shorter than half the width; antennæ 12-jointed, 2nd joint twice as long as 3rd; pronotum saddle-shaped, anterior border not emarginate.

Length of body 3.50 mm.

Width of head 0.72 mm.

Width of pronotum 0.41 mm.

Habitat.—Dobo, Arue Island (Dutch New Guinea); collected by Mr. Kanehira on May 7, 1913.

20. Eutermes (Tumulitermes) boetoni nov. sp.

(Pl. X., fig. 11).

Imago unknown.

Soldier.—Head dark brown; abdominal tergites yellowish brown, sternites straw-colour; antennæ yellowish brown; anterior border of pronotum brown. Head sparingly provided with long spiny hairs; abdominal tergites densely covered with minute hairs, with a series of longer spiny hairs along the posterior border.

Head broadly oval, the sides converging anteriorly; rostrum conical, its anterior surface in a plane with the anterior surface of head; basal part of rostrum slightly swollen dorsally; antennæ 13-jointed, 3rd joint as long as or slightly longer than 2nd, 4th joint shorter than 3rd; pronotum saddle-shaped, very short, with anterior border convex, not emarginate.

Length of body 3,20–3,80 mm.

Length of head with rostrum 1,28–1,38 mm.

Length of head without rostrum 0,84 mm.

Width of head 0,84 mm.

Width of pronotum 0,41 mm.

Worker —Head chestnut brown; sutures of head, anterior border of transversal band, basal portion of clypeus, and abdomen pale yellow. Head and abdominal tergites provided with subequal hairs.

Head quadrate, slightly longer than broad; basal portion of clypeus swollen, nearly half as long as broad; antennæ 14-jointed, 2nd joint as long as 3rd, 4th joint shorter than 3rd; mandibles with slender, short apical portion; pronotum saddle-shaped, anterior border not emarginate.

Length of body 3,50 mm.

Width of head 0,81 mm.

Width of pronotum 0,44 mm.

Habitat.—Boeton, Celebes; collected by Mr. Kanehira on April 29, 1913.

21. Eutermes (Trinervitermes) menadoensis nov. sp.

(Pl. X., figs. 9-10).

Imago unknown.

Soldier (the larger form).—Head reddish brown, abdomen straw-coloured. Head coarsely provided with microscopical hairs, mingled with a few longer spiny hairs; abdominal tergites moderately pilose, with a series of longer spiny hairs along the posterior border.

Head broadly oval; rostrum conical, its anterior surface in the same plane as the anterior surface of head, with a slight swelling behind the junction to head; antennæ 13-jointed, 3rd joint twice as long as 2nd, 4th joint as long as 2nd; mandibles with rudimentary apical portion; pronotum saddle-shaped, anterior border scarcely indented in the middle, sides rounded.

Length of body	4,30 mm.
Length of head with rostrum .. .	1,68 mm.
Length of head without rostrum .. .	1,00-1,09 mm.
Width of head .. .	1,09-1,13 mm.
Width of pronotum .. .	0,53 mm.

Soldier (the smaller form).—With all the characters of the larger form but smaller.

Length of body .. .	2,50-3,20 mm.
Length of head with rostrum .. .	1,53-1,63 mm.
Length of head without rostrum .. .	0,97-1,00 mm.
Width of head .. .	0,97-1,06 mm.
Width of pronotum .. .	0,50 mm.

Worker.—Head dark brown; basal portion of clypeus pale yellow; sutures of head and abdomen yellowish white. Head sparingly pilose; abdominal tergites provided with short hairs.

Head nearly pentagonal, sides slightly converging anteriorly; basal portion of clypeus shorter than half the width, markedly swollen; antennæ 14-jointed, 2nd joint as long as 3rd, 4th joint shorter than 3rd; pronotum saddle-shaped, anterior border not emarginate.

Length of body 5,00 mm.

Width of head 1,16 mm.

Width of pronotum 0,75 mm.

Habitat.—Menado, Celebes (May 19. 1913); Sandakan, Borneo (July 9, 1913); collected by Mr. Kanehira.

22. *Eutermes* (*Grallatotermes*) *luzonicus* nov. sp.

(Pl. X., figs. 15-16).

Imago unknown.

Soldier (the larger form).—Head dark brown; abdomen dark yellow, shiny. Head very sparingly provided with spiny hairs; abdominal tergites densely provided with minute hairs, two or three posterior tergites with longer spiny hairs along the posterior border.

Head broadly oval; rostrum conical, its anterior surface making a curve with the anterior surface of head, basal part slightly swollen dorsally; mandibles with a short apical portion; antennæ 13-jointed, 3rd and 4th joints longer than 2nd; pronotum saddle-shaped, anterior border slightly emarginate at middle, posterior border rounded.

Length of body 4,00 mm.

Length of head with rostrum 1,78-1,81 mm.

Length of head without mandible 1,06 mm.

Width of head 1,16-1,22 mm.

Width of pronotum 0,56 mm.

Soldier (the smaller form).—Head and abdominal tergites nearly smooth, very sparingly provided with spiny hairs; antennæ 13-jointed, 3rd joint nearly as long as 2nd.

Length of body	3,50 mm.
Length of head with rostrum	1,65 mm.
Length of head without rostrum	1,00 mm.
Width of head	1,09 mm.
Width of pronotum	0,50 mm.

Worker (the larger form).—Head chestnut brown, sparingly provided with spiny hairs; abdominal tergites covered with minute hairs, posterior ones with longer hairs.

Head quadrate, with rounded posterior border; sutures of head distinct; basal portion of clypeus much shorter than half the width, slightly swollen; antennæ 14-jointed, 3rd joint longer than 2nd, 4th joint shorter than 3rd; pronotum saddle-shaped, anterior border two-lobed.

Length of body	5,00 mm.
Width of head	1,25 mm.
Width of pronotum	0,78 mm.

Worker (the smaller form).—Head dark brown, transversal band considerably paler. Head coarsely pilose, abdominal tergites densely provided with minute hairs, with a series of spiny hairs along the posterior border; sutures of head very distinct; antennæ 14-jointed, 2nd joint as long as 3rd, 4th joint much shorter than 3rd; pronotum saddle-shaped, anterior and posterior borders rounded, not emarginate at middle.

Length of body	3,80 mm.
Width of head	0,94 mm.
Width of pronotum	0,44 mm.

Habitat.—Los-Banos, Luzon; collected by Prof. Baker.

Genus *Microcerotermes* Wasmann.**23. *Microcerotermes los-banosensis* nov. sp.**

(Pl. X., fig. 6).

Imago unknown.

Soldier.—Head yellow; mandibles brown; abdomen white. Head very sparingly pilose; abdominal tergites thinly provided with microscopical hairs.

Head quadrangular, elongated, with rounded corners, slightly vaulted dorsally, truncated in front; no fontanelle; posterior border of clypeus arcuate, anterior border straight; labrum short and broad, tongue-shaped; mandibles slender, sabre-shaped, with strongly incurved piercing tip, masticating edge minutely serrated; antennæ 13-jointed, 1st joint very stout, 3rd joint shorter and narrower than 2nd, 4th joint as long as 2nd; pronotum saddle-shaped, anterior and posterior border rounded.

Length of body	5,50 mm.
Length of head with mandible	2,56–2,66 mm.
Length of head without mandible	1,66–1,72 mm.
Width of head	1,03 mm.
Width of pronotum	0,34 mm.
Length of pronotum	0,66 mm.

Worker.—Head pale yellow; abdomen white. Head moderately pilose; abdominal tergites deusely provided with minute hairs.

Head broadly oval, slightly longer than broad; sutures of head indistinct, whitish; basal portion of clypeus half as long as broad, anterior border straight, posterior border convex, slightly swollen, with a shallow median groove; antennæ 13-jointed, 3rd joint minute, half as long as 2nd, 4th joint longer than 3rd; pronotum saddle-shaped, anterior border slightly emarginate at middle.

Length of body	4,20 mm.
Width of head	0,94 mm.
Width of pronotum	0,58 mm.

Habitat.—Los-Banos, Luzon; collected by Prof. Baker.

24. *Microcerotermes distans* (Haviland).

(Pl. X., fig. 5).

Soldier.—Head reddish yellow; pronotum yellow; abdomen straw-coloured, with dark white patches due to the contents of alimentary canal.

Head cylindrical, flattened, truncated in front; fontanelle distinct, minute, situated just behind forehead; labrum tongue-shaped, broad, with pointed tip; mandibles sabre-shaped, masticating edge irregularly serrated; antennæ 13-jointed, 2nd joint twice as long as 3rd; pronotum saddle-shaped, anterior border distinctly indented in the middle; apical joint of tibia with 3 spines at tip.

Length of body	5,50–6,00 mm.
Length of head with mandible	3,06 mm.
Length of head without mandible	1,94 mm.
Width of head	1,16 mm.
Width of pronotum	0,31 mm.
Length of pronotum	0,75 mm.

Worker.—Head pale brown, abdomen whitish. Head sparingly pilose; abdominal tergites densely provided with hairs.

Head round; basal portion of clypeus markedly swollen, half as long as broad, anterior border straight, posterior border convex; fontanelle indistinct; antennæ 13-jointed, 2nd joint longer than 3rd; pronotum saddle-shaped.

Length of body	4,10–4,50 mm.
Width of head	1,09 mm.
Width of pronotum	0,69 mm.

Habitat.—Ambon, Moluccas; collected by Mr. Kanehira, date unknown.

Explanation of plates.

Plate IX.

- Fig. 1. *Coptotermes flavicephalus*. Soldier.
Fig. 2. *Coptotermes bornensis*. Soldier.
Fig. 3. *Coptotermes dobonicus*. Soldier.
Fig. 4. *Coptotermes travians*. Soldier.
Fig. 5. *Coptotermes hongkonensis*. Soldier.
Fig. 6. *Termes* (T.) *Copelandi*. Smaller form of soldier.
Fig. 7. *Termes* (T.) *Copelandi*. Larger form of soldier.
Fig. 8. *Termes* (M.) *philippinensis*. Smaller form of soldier.
Fig. 9. *Termes* (M.) *philippinensis*. Larger form of soldier.
Fig. 10. *Termes* (M.) *luzonensis*. Smaller form of soldier.
Fig. 11. *Termes* (M.) *luzonensis*. Larger form of soldier.
Fig. 12. *Odontotermes* (O.) *celebensis*. Soldier.

Plate X.

- Fig. 1. *Parrhinotermes inaequalis*. Soldier.
Fig. 2. *Rhinotermes* (S.) *tarakanensis*. Smaller form of soldier.
Fig. 3. *Rhinotermes* (S.) *longirostris*. Smaller form of soldier.
Fig. 4. *Rhinotermes* (S.) *longirostris*. Larger form of soldier.
Fig. 5. *Microcerotermes distans*. Soldier.
Fig. 6. *Microcerotermes los-banosensis*. Soldier.
Fig. 7. *Eutermes* (H.) *spinocephalus*. Soldier.
Fig. 8. *Eutermes* (E.) *sandakanensis*. Soldier.
Fig. 9. *Eutermes* (Tr.) *menadoensis*. Larger form of soldier.
Fig. 10. *Eutermes* (Tr.) *menadoensis*. Smaller form of soldier.
Fig. 11. *Eutermes* (Tum.) *boetoni*. Soldier.
Fig. 12. *Eutermes* (E.) *doboensis*. Soldier.
Fig. 13. *Eutermes* (E.) *buitenzorgi* Soldier.
Fig. 14. *Eutermes* (S.) *Kanehirae*. Soldier.
Fig. 15. *Eutermes* (G.) *luzonicus*. Larger form of soldier.
Fig. 16. *Eutermes* (G.) *luzonicus*. Smaller form of soldier.

Notes on the Japanese Myopsida.

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With 2 plates and 1 textfigure.

In the present paper, the Myopsids alone will be considered, reserving the remaining groups to future publications. The material consisted principally of the specimens in the Museum of the Science College, Tōkyō, in addition to which were examined those preserved in the Imperial Museum (Tokyo), in the Fishery Bureau, in the Fishery Institute of Namerikawa (Toyama Prefecture), in the Fishery Experimental Institute of Takashima (Hokkaido), and in the Sapporo College of Agriculture.¹⁾

Species known to me at present of the Japanese Myopsida group themselves into thirteen genera represented by forty-four species, of which five are doubtful and another five are new to science. The list is as follows:—

1. *Euprymna morsei* (Verrill).
2. *Euprymna similis* n. sp.
3. [*Sepiola japonica* Tilesius & d'Orbigny.]
4. *Iniotenthis iniotenthis* (Naef).

1) I wish here to express my thanks to Professor S. Watase under whose supervision the work was done. I wish also to acknowledge my indebtedness to Professor S. Hata for various acts of courtesy. My thanks are also due to Professor T. Iwakawa and further to Messrs. T. Kitahara, K. Tago, I. Moriwaki and K. Koishi for kindly placing specimens under their charge at my disposal.

5. *Inioteuthis parva* n. sp.
6. *Sepiolina nipponensis* (Berry).
7. *Sepiadarium kochii* Steenstrup.
8. *Rossia pacifica* Berry.
9. *Promachoteuthis megaptera* Hoyle.
10. *Idiosepius pygmaeus* Steenstrup.
11. *Loligo edulis* Hoyle.
12. *Loligo chinensis* Gray.
13. *Loligo japonica* Steenstrup.
14. [*Loligo teradinamia* Ortmann.]
15. *Loligo sumatrensis* d'Orbigny.
16. *Loligo kobeensis* Hoyle.
17. *Loligo aspera* Ortmann.
18. *Loligo bleekeri* Keferstein.
19. *Sepioteuthis lessoniana* Férussac.
20. *Sepioteuthis sieboldi* Joubin.
21. [*Sepioteuthis brevis* Owen.]
22. [*Sepioteuthis sinensis* d'Orbigny.]
23. *Sepia torosa* Ortmann.
24. *Sepia formosana* Berry.
25. *Sepia aculeata* Van Hasselt.
26. *Sepia subaculeata* n. sp.
27. *Sepia esculenta* Hoyle.
28. *Sepia elliptica* Hoyle.
29. *Sepia hercules* Pilsbry.
30. *Sepia myrsus* Gray.
31. *Sepia (Doratossepion) andreana* Steenstrup.
32. *Sepia (Doratossepion) andreanoides* Hoyle.
33. *Sepia (Doratossepion) pardalis* n. sp.
34. *Sepia (Doratossepion) tokyoensis* Ortmann.
35. *Sepia (Doratossepion) misakiensis* Wülker.
36. *Sepia (Doratossepion) kobeensis* Hoyle.

37. *Sepia* (*Doratosepion*) *petersensi* Appellöf.
38. *Sepia* (*Doratosepion*) *appellöfi* Wülker.
39. *Sepia* (*Doratosepion*) *lorigera* Wülker.
40. *Sepia* (*Doratosepion*) *longipes* n. sp.
41. *Metasepia tullbergi* (Appellöf).
42. *Sepiella maindroni* de Rochebrune.
43. *Sepiella inermis* (Van Hasselt).
44. [*Sepiella sinensis* (d'Orbigny).]

The species in square brackets are those which are either quite doubtful or are possibly synonymous with some other species.

Division MYOPSIDA d'Orbigny 1846.

Fam. SEPIOLIDÆ Steenstrup 1861.

Subfam. SEPIOLINÆ.

Genus *Euprymna* Steenstrup 1887.

1. *Euprymna morsei* (Verrill 1881) sens. lim.

Local name: Mimi-ika (Tôkyo, Sagami, Kagoshima),

Dango-ika (Etchû), Hidoko-ika (Nagasaki).

Plate XI., figs. 1-4.

Inioteuthis morsei, Verrill 1881, p. 417, foot note (Yeddo Bay), p.p.—Appellöf 1886, p. 15, pl. ii, figs. 15, 16; pl. iii, figs. 16, 19, 20, 23 (Nagasaki).—Hoyle 1886, p. 112, pl. xiv, figs. 1-9 (Kobe Bay).—Ortmann 1888, pp. 647, 665, pl. xxi, fig. 7; pl. xxii, fig. 3 (Tôkyo Bay, Kadsiyama, Kagoshima).—Goodrich 1896, p. 3 (Andamans).—Joubin 1897, p. 101 (Nagasaki, Philippines).—Joubin 1902, p. 97, figs. 11, 12.

Sepiola bursa, Pfeffer 1884, p. 6, fig. 6 (Hongkong).

Euprymna morsei, Steenstrup 1887, pp. 66, 89.—Hoyle 1904, p. 26.

—Hoyle 1904a, p. 198 (Ceylon).—Hoyle 1905, p. 981 (Kolumadulu Atoll, Indian Sea).—Berry 1909, p. 418 (Hawaiian Island).—Wülker 1910, p. 9, pl. i, fig. 9; pl. iii, figs. 23, 24; pl. iv, fig. 40 (Misaki and Dzushi).—Naef 1912, p. 247. —Berry 1912a, p. 408, pl. vi, figs. 1, 2 (Tôkyo Bay, Wakano-ura, Onomichi, Nagasaki, Japan; Takao, Formosa; Hongkong).

List of specimens examined.

Specimens.	Locality	Date	Where preserved
2♀	Kagoshima	March 29, 1896	Sci Coll.
1♂, 2♀	Beppu, Bungo Prov.	March 13, 1899	do
6 juv.	Hososhima, Hiuga Prov.	March 15, 1899	do
1♀	Miyazu Bay	July 9, 1903	do
5♀	Horii, Shimo-osa Prov.	May 2, 1906	do
6♀	Kanagawa Prefecture	1906	do
1♂, 1♀	Ohmura Bay	Dec. 1908	do
3♂, 4♀	Namerikawa, Etchû Prov.	April 29, 1913	Agr. Coll.
1♀	Himi, Etchû Prov.	May 8, 1913	do
1♂, 1♀	Sumoto, Awaji	—	Sci Coll.
1♂	Misaki	—	do
2♀	Nagasaki	—	Agr. Coll.

The principal characteristics of this species lie in the tentacular suckers being elongated into a goblet-like shape and provided each with a minute aperture leading into a passage which communicates at right angles with the cavity of the long bell-shaped horny ring (Pl. XI, figs. 3, 4), and in the arm-suckers of males being very unequal in size, several of the marginal series on both sides in the second,

third and fourth arms being much larger than any other of the suckers (Pl. XI, fig. 1).

2. *Euprymna similis* sp. nov.

Pl. XI, figs. 5-8.

Euprymna morsei, Verrill 1881, p. 417, foot note (Yeddo Bay), p.p. ?.

Diagnosis. Body oblong, rounded behind as usual in the Sepiolidae, and slightly longer than broad, the breadth being equal to about three-fourths the length; fins subcircular, notched at the anterior attachment to body and slightly longer than half the length of mantle. Mantle joins the head dorsally by a broad ligament, the breadth of which is about equal to the distance from eye to eye. Head a little narrower than body, with slightly prominent eyes. Siphon slenderly conical, nearly extending to the angle between ventral arms; siphonal clasping apparatus elliptical, with a deep median groove for clasping the linear cartilaginous ridge of mantle.

Arms rather unequal, the order of length being 2, 3, 4=1; the longest is as long as the mantle; all are slender and taper gradually towards end; the carination of their outer surface indistinct. Suckers somewhat spherical with small aperture and slender peduncle, arranged in four series, except a few basal and terminal ones which are in two series; size of suckers greatly differs in the sexes. In the female they are all equally small, while in the male those of marginal series are always larger than those of inner series, and again, those of ventral marginal series are much larger than those belonging to dorsal marginal series. The last characterization is especially distinct in the second, third and fourth arms (Pl. XI, fig. 5). Horny ring of suckers with entire edges, that in the smaller suckers oval in shape with the long axis transversely directed; that in the larger ones with the upper and lower margins somewhat projecting forward and beak-like (Pl. XI, fig. 6).

The hectocotylus is the left dorsal, as usual in *Euprymna*, closely resembling in its features that of *E. morsei*. There are in the proximal half of the hectocotylus about thirty small and spherical suckers arranged nearly in four series and of which the three or four distalmost of the dorsal side are larger than the others. Two nipple-like protuberances project from the suckers at the ventro-proximal part. The distal half of the hectocotylus is provided with about forty unstalked cylindrical suckers which are a little laterally compressed at their end, and are closely arranged in three or four series except in the terminal parts where they are arranged generally in two series (Pl. XI, fig. 6).

Tentacles nearly as long as the mantle, sometimes much longer; stem flattened on the inner side, rounded on the outer, and the inner dorsal angle produced into a thin membrane which distally widens a little; club not expanded, rather short, being of about one-sixth the length of tentacle, pointed at the end; suckers arranged in numerous series, exceedingly small, greatly elongated at base; not goblet-shaped as in *E. morsei*, but very short and spherical or subcylindrical, with minute aperture, the horny edge of which is entire and is surrounded by a broad papillary area (Pl. XI, fig. 7, 8).

Skin smooth throughout, spotted all over with purplish brown chromatophores in alcoholic specimens. Luminous organ developed in mantle cavity. Gladius absent.

Type. Male obtained at Takashima, and female at Oshoro; both May 12, 1909; preserved in alcohol. Both the localities are in Hokkaido.

Measurements of the types :

	Male mm.	Female mm.
Dorsal length of mantle (between nuchal ligament and posterior end of mantle).....	24	33
Ventral length of mantle	25	35
Breadth of mantle.....	19	24

	Male mm.	Female mm.
Length of head (between nuchal ligament and umbrella margin between dorsal arms)	11.5	16
Breadth of head	17	23
Breadth of nuchal ligament	11	14
Length of fin	17	23
Breadth of fin	11.5	18
Length of fin at plane of attachment	10	15
Distance from mantle margin to anterior end of fin attachment	8	10.5
Length of first arm (right)	15.5	27
„ „ second arm (do)	30	33
„ „ third arm (do)	26	30
„ „ fourth arm (do)	21.5	26.5
Length of tentacle (do)	34	35
„ „ club (do)	8	10

List of cotypes.

Specimens	Mantle-length	Locality	Date	Where preserved
1♂	19 mm	Takashima, Hokkaido	May 12, 1909	Agr. Coll.
3♂	19 mm in each	Off Wakimoto, Oshima Prov., Hokkaido	Oct. 27, 1912	Fish. Exp. Inst. Takashima
2♂	19 mm	Misaki	—	Agr. Coll.
1♀	32 mm	Oshoro, Hokkaido	May 12, 1909	do
1♀	22.5 mm	Takashima	Oct. 3, 1910	do
1♀	20 mm	Off Kikonai, Oshima Prov., Hok.	Oct. 19, 1912	do

Remarks. The present species has a very close affinity to the preceding *E. morsei*, but differs from it very markedly in the shape of tentacular suckers and in the size of arm-suckers in the male.

Small as these differences may seem, I consider them sufficiently important to be used for the specific distinction. The characters in question were found to be constant, and although a large series of specimens have been examined, no intermediate forms between the two species have as yet been discovered.

Genus *Sepiola* Leach 1817.

3. [*Sepiola japonica* Tilesius et d'Orbigny, 1839.]

Sepiola japonica, d'Orbigny (from Tilesius MS.) in d'Orb. et Férussac 1839, p. 234 (Japan).—d'Orbigny 1845, p. 251.
Sepiola? *japonica*. Gray 1849, p. 93.—Tryon 1879, p. 157.
 This is at best a doubtful species.

Genus *Iniotheuthis* Verrill 1881.

4. *Iniotheuthis iniotheuthis* (Naef 1912).

Local name : Chôchin-ika (Himi, Etchû Prov.), Dango-ika (Namerikawa, Etchû Prov.).

Iniotheuthis japonica, Verrill 1881, p. 417, foot note (Yeddo Bay).—Ortmann 1888, p. 647, pl. xxi, fig. 6; pl. xxii, fig. 2 (Tôkyo Bay).—Joubin 1897, p. 101 (Nagasaki).—Joubin 1902, p. 95, fig. 10.—Hoyle 1904, p. 27.—Wülker 1910, p. 10 (Misaki, Entrance of Uraga channel).—Berry 1912a, p. 405, pl. v, fig. 5 (Tôkyo Bay; Matsushima, Rikuzen; Enoshima, Sagami).

Sepiola iniotheuthis, Naef 1912, p. 268.

This species which was first taken by Verrill to be identical with the preceding doubtful *Sepiola japonica*, though assigning it to his *Iniotheuthis*, was later made by Naef into a new species under the name of *Sepiola iniotheuthis*. While I regard it proper to accept Verrill's

generic designation for the species, Naef's specific name may well be retained until a more precise knowledge than we have at present about the Sepiolid in question would necessitate a change.

5. *Inioteuthis parva* sp. nov.

Pl. XI., figs. 9, 10.

Diagnosis. Body short, somewhat spherical, about as long as broad, rounded behind as usual. Fins moderately large, nearly circular in outline, longer than half the length of mantle, joined in the middle of mantle-length, notched at the anterior attachment, the line of attachment very short, being not longer than about one-third the mantle-length; mantle joined to head by a skin which is narrower than the distance between eyes. Head large, about as broad as body, with big eye-balls; siphon long, reaching the angle between ventral arms, conical at base and tubular distally.

Arms subequal, the order of their length being 3, 2, 1=4, the longest as long as mantle. Suckers nearly spherical, with small aperture, distinctly arranged in two series, their size differing in different arms as follows: In the first arm (right side), there are about thirty equally small suckers. In the second arm, proximal forty suckers are very large, except the two basalmost which are as small as those of the first arm; distally there are about eight small terminal ones. Third arm similarly provided with suckers as the second, only here the large suckers number about sixteen and the small terminal ones about twelve. In the fourth arm, there are in all about twenty-five suckers, of which the middle ones are a little larger than the rest, but not so large as the largest in the second and third arms. The suckers have horny rings with entire edge (Pl. XI, fig. 9).

The hectocotylus is the left dorsal arm (Pl. XI, fig. 10). The suckers on it are arranged in two series, right and left. The

left series is made up as follows: two basalmost suckers small; then there is a large papilla-like process, followed by two small suckers; after that there come two or three large ones, in their turn followed distally by a close series of eleven or twelve peculiar unstalked and cylindrical suckers. In the right series, there are at base two small suckers which are a little larger than the opposite ones of the left series; then there follow four suckers which are about as large as the largest ones of the left; finally there occur about eleven or twelve suckers similar to, but a little shorter than, those in corresponding position of the other side.

Tentacles slightly shorter than twice the length of longest arm; club a little swollen in the middle and narrowed towards the pointed extremity, with a long web along back; sucker uniformly minute, arranged in about eight series.

Skin smooth and dotted all over with relatively large chromatophores. Luminous organ of the mantle cavity well developed. Gladius absent.

Type. Two ♂ specimens in alcohol, Tōkyo Bay, July 1910 (Sci. Coll.). The measurements are as follows:

	mm.	mm.
Length of mantle (ventral).....	10	11
Length of head.....	7	7
Breadth of body	10	10.6
Breadth of head	9.8	10.2
Breadth of fin	5	5.4
Length of fin.....	6	6.5
Distance from mantle-margin to anterior attachment of fin.....	3.1	3.3
Extent of attachment of fin	3	3.5
Length of first arm (right).....	8	8.3
„ „ second arm (do)	9.5	10
„ „ third arm (do)	9.8	11.3

	mm.	mm.
Length of fourth arm (right)	8.5	8.5
„ „ tentacle (do)	16.5	16

Genus *Sepiolina* Naef 1912.

6. *Sepiolina nipponensis* (Berry 1911).

Stoloteuthis nipponensis, Berry 1911a, p. 36, 1 textfig. (Suruga Bay).—Berry 1912a, p. 414, pl. v, figs. 1-4.

Sepiolina nipponensis, Naef 1912, p. 248.

List of specimens examined by me:

- i. Two ♂, specimens Kagoshima, Aug. 12, 1899 (Sci. Coll.).
Mantle-length 18.5 mm, 20 mm.
- ii. Two ♂, specimens Kagoshima, March 29, 1912 (Agr. Coll.).
Mantle-length 18 mm, 19 mm.

The specimens do not tally well with the genus *Stoloteuthis* of Verrill, but may be left in the genus *Sepiolina*. Comparing them with Berry's original description of the species, the following differences are noticeable: the umbrellas between the arms are all pretty wide and especially so between the dorsal arms where the umbrella extends to about the middle of the arms, instead of all being similarly narrow; the fins are not so large as to extend to the anterior margin of mantle, but are rather small as usual in Sepioids; the order of arms is 2=3, 1, 4, instead of 2, 1, 3, 4.

Subfam. SEPIADARINÆ.

Genus *Sepiadarium* Steenstrup 1881.

7. *Sepiadarium kochii* Steenstrup 1881.

Sepiadarium kochii, Steenstrup 1881, p. 214, pl. i, figs. 1-10 (Hongkong, India).—Brock 1887, p. 595 (Amboina).—Goodrich 1896, p. 3 (Off the southern coast of Ceylon, Andamans).—Appellöf 1898, p. 593, pl. xxxii, figs. 9, 10; pl. xxxiii,

figs. 14, 19, 21; pl. xxxiv, figs. 23, 25, 27.—Hoyle 1904a, p. 198 (Ceylon).

List of specimens examined.

Specimens	Mantle-length	Locality	Date	Where preserved
1♂	12 mm	Enoura, Suruga	April 1886	Sci. Coll.
1♂	13 mm	Off Nukumi, Satsuma	April 8, 1896	do
3♂	15-16 mm	Beppu, Bungo	March 13, 1899	do
1♂	13.5 mm	Kurihama, Musashi	April 8, 1911	Agr. Coll.
2♀	16 mm in each	Nagasaki	—	do

Specimens examined differ from Steenstrup's original description of the species in that the six or seven proximal suckers in all the arms are distinctly smaller than the others more distally situated, instead of being of a uniform size as represented in his figures; in that the order of arms is 3, 2, 1, 4, and not 1, 3, 4, 3 as given by him; and finally in the normal suckers of the proximal part of the hectocotylus numbering 15, instead of 17 or 18.

Subfam. ROSSINÆ.

Genus *Rossia* Owen 1834.

8. *Rossia pacifica* Berry 1911.

Rossia pacifica, Berry 1911, p. 591 (Behm Canal, Alaska).—Berry 1912, p. 290, pls. xli-xlii; pl. xliii, figs. 1-4; pl. xlv, figs. 1, 5 (Alaska, Washington, California).

?*Rossia* sp. Berry 1912a, p. 417 (Off the northwestern coast of Honshû).

List of specimens examined.

Specimens	Mantle-length	Locality	Date	Where preserved
1♀	51 mm	Namerikawa, Etchû	May 23, 1905	Sci. Coll.
1♂, 3♀	62-41 mm	Hakodate, Hokkaido	Jan. 21, 1908	do
1♀	70 mm	Takashima, Hokkaido	Feb. 1909	Agr. Coll.
3♂, 1♀	38-20 mm	Namerikawa, Etchû	April 25, 1913	do
1♀	76 mm	Uodzu, Etchû	—	do

Genus *Promachoteuthis* Hoyle 1885.

A genus of very doubtful systematic position.

9. *Promachoteuthis megaptera* Hoyle 1885.

Promachoteuthis megaptera, Hoyle 1885, p. 273, fig. 109 (North-east of Nosima).—Hoyle 1885a, p. 182.—Hoyle 1885b, p. 284.—Hoyle 1886, p. 120, pl. xiv, figs. 10-14, textfig. 3.—Joubin 1902, p. 109, fig. 17.—Berry 1912a, p. 417.

No new observation on the species has been made since it was first described by Hoyle from a specimen obtained by the Challenger.

Fam. IDIOSEPIIDÆ Appellöf 1898.

Genus *Idiosepius* Steenstrup 1881.

10. *Idiosepius pygmæus* Steenstrup 1881.

Japanese: Hina-ika (n.n.).

Idiosepius pygmæus, Steenstrup 1881, p. 219, pl. i, figs. 11-22 (Near Singapore and Philippine Islands).—Appellöf 1898, pp.

562, 572, pl. xxxii, figs. 1-5, 7; pl. xxxiii, figs. 11-13, 20, 22; pl. xxxiv, figs. 24, 26, 29, 30 (Ternate).—Wülker 1910, p. 22.
Microteuthis paradoxa, Ortmann 1888, p. 649, pl. xxii, fig. 4 (Kadsiyama).—Joubin 1902, p. 105, fig. 15.

Idiosepius paradoxa, Berry 1912a, p. 405.

List of specimens examined by me:

- i. Six specimens 3 ♂, 3 ♀, Misaki, Dec. 29, 1908 (Agr. Coll.).
Mantle-length 8—6.5 mm.
- ii. Four specimens 1 ♂, 3 ♀, Inland Sea (Agr. Coll.). Mantle-length 7—9 mm.

The Japanese specimens deviate from Steenstrup's description in some noteworthy points. According to him, each hectocotylus has only one sucker and no valve at all; whereas, I find in the specimens before me that the right hectocotylus is provided with 3-5, and the left hectocotylus with 4-7 suckers (this characterization agrees with that of Appellöf's specimens from Ternate), and that there exists a semicircular membrane at the extremity of the left hectocotylus. Further, the tentacles are about as thick as the arms and about twice as long as the longest arm, the distal half or three-fourths of the length being taken up by the club, while according to Steenstrup they should be much thinner than the arms, and the club shorter than half the entire length of tentacle.

Fam. **LOLIGINIDÆ** Steenstrup 1861.

Genus *Loligo* Schneider 1784.

11. *Loligo edulis* Hoyle 1885.

Local name: Kensaki-ika (Tôkyo), Gotô-ika (Ôshima, Idzu Prov.), Aka-ika (Etchû Prov.).

Loligo edulis, Hoyle 1885a, p. 186 (Yokohama market).—Hoyle 1885b, p. 281.—Hoyle 1886, p. 152, pl. xxiii.—Ortmann

1888, p. 663.—Brazier 1892, p. 16 (Port Jackson, Australia).
—Berry 1912a, p. 398. (Tôkyo Bay ; Wakanoura ; Aomori ;
Samé, Mutsu Prov.).

List of specimens examined.

No.	Specimens	Locality	Date	Where preserved
i	1♀	Akune, Satsuma	April 20, 1896	Sci. Coll.
ii	1♀	Ôshima, Izu	—	do
iii	25♂, 10♀	Misaki	May 24, 1896	do
iv	3♂, 4♀	Misaki	1896	do
v	3 juv.	Hayakawa, Odawara	Dec. 22, 1908	do
vi	1♀	Misaki	Nov. 1908	do
vii	1♂	Namerikawa, Etchû	May, 1913	Agr. Coll.
viii	1♂	Namerikawa	July 15, 1913	Fish. Inst. Namerikawa

Specimens Nos. vii and viii differ a little from the Challenger specimens in the hectocotylized arm bearing very minute suckers on the conical papillæ of the terminal portion, instead of being entirely without them.

This is the largest of *Loligo* species occurring in Japan and is one of the commonest. It is most abundant in South Japan and becomes less common in the northern parts.

12. *Loligo chinensis* Gray 1849.

Local name: Aka-ika (Nagasaki).

Loligo chinensis, Gray 1849, p. 74 (China).—Tryon, 1879, p. 145.—Ortmann 1888, p. 657, pl. xxiv ; pl. xxv, figs. 2a-2d

(Tôkyo Bay, Kadsiyama).—Berry 1912a, p. 398.

List of specimens examined by me.

- i. One ♂ specimen, Shigeki-mura, Nagasaki Pref., Dec. 22, 1908 (Sci. Coll.). Mantle-length 105 mm.
- ii. Two ♂ specimens, Nagasaki (Agr. Coll.). Mantle-length 63 mm, 80 mm.

13. *Loligo japonica* Steenstrup 1885.

Local name : Bôzu-ika (Etchû), Hi-ika (Tottori).

Loligo japonica, Steenstrup MS. in Hoyle 1885a, p. 187 (Yokohama market).—in Hoyle 1885b, p. 290.—Hoyle 1886, p. 157, pl. xxiv, figs. 7-15.—Ortmann 1888, p. 663.—Wülker 1910, p. 10 (Misaki).—Berry 1912a, p. 399.

List of specimens examined.

Specimens	Locality	Date	Where preserved
3♂, 4♀	Tôkyo market	Oct. 1, 1885	Sci. Coll.
3♀	Sagami Bay	Feb. 16, 1901	do
1♀	Shimané Prefecture	Nov. 10, 1905	do
1♀	Ômura Bay	Dec. 1908	do
25♂, 20♀	Uodzu, Etchû	April 25, 1913	Agr. Coll.
19♂, 15♀	Namerikawa, Etchû	April 27, 1913	do
8♂, 7♀	Oshoro, Hokkaidô	July 29, 1913	do

This species is very common in northern Japan. The arm-suckers of the males are larger than those of the females, as shown in the following table :

Specimens	Male				Female			
	1	2	3	4	1	2	3	4
Measurements								
Mantle-length	mm 98	mm 97	mm 87	mm 83.5	mm 105	mm 104	mm 104	mm 90
Diameter of the largest sucker of 1st arm	1.5	1.5	1.1	1.5	1.3	1.5	1.5	1.5
Diameter of the largest sucker of 2nd arm	3.5	3.5	3.5	3.8	2.6	2.8	2.5	2.4
Diameter of the largest sucker of 3rd arm	4	4	3.6	4	3.5	3.4	3.2	3.3
Diameter of the largest sucker of 4th arm	2	2	2	2	1.6	1.5	1.5	1.6

14. [*Loligo tetradinamia* Ortmann 1888.]

Loligo tetradinamia, Ortmann 1888, p. 659, pl. xxiii, figs. 4a-4k; pl. xxv, fig. 1 (Tôkyo Bay; Kôchi, Tosa).—Berry 1912a, p. 399 (Samé, Mutsu Prov; Tôkyo Bay; Tôkyo; Okayama; Kawatana, Hizen Prov.).

After examining a large series of *L. japonica*, I quite agree with Berry in the opinion that the present species is possibly synonymous with *L. japonica*.

15. *Loligo sumatrensis* d'Orbigny 1839.

Local name: Beka (Okayama).

Loligo sumatrensis, d'Orbigny, in d'Orb. et Férussac 1839, p. 317; *Loligo*, pl. xiii, figs. 1-3 (Indian Ocean, Sumatra).—d'Orbigny 1845, p. 349.—Gray 1849, p. 77.—Tryon 1879, p. 145, pl. lviii, figs. 190, 191.—Appellöf 1886, p. 32, pl. i, fig. 11; pl. iii, figs. 11-15 (Nagasaki).—Brock 1887, p. 595 (Amboina).—Ortmann 1888, p. 664.—Berry 1912a, p. 399.

List of specimens examined by me.

- i. Six specimens, 1 ♂, 5 ♀, Okayama market, April 25, 1901 (Sci. Coll.). Mantle length 67-53 mm.

- ii. Two ♀ specimens, Kojima Bay, Oct. 1903 (Agr. Coll.). Mantle-length 65-52 mm.

16. *Loligo kubiensis* Hoyle 1885.

Local name: Shiro-ika (Nagasaki), Teppo-ika (Tosa).

Loligo kubiensis, Hoyle 1885a, p. 184 (Off Kobe, South of Japan, Inland Sea ?).—Hoyle 1885b, p. 287.—Hoyle 1886, p. 154, pl. xxv, figs. 1-10.—Ortmann 1888, p. 659 (Maizuru).—Hoyle 1905, p. 982 (Kolumadulu Atoll).—Berry 1912a, p. 398 (Onomichi, Bingo Prov.; Nagasaki).

List of specimens examined by me.

- i. One ♀ specimen, Urado, Tosa Prov., Aug. 14, 1905 (Sci. Coll.). Mantle-length 75 mm.
- ii. Fourteen ♀ specimens, Nagasaki (Agr. Coll.). Mantle-length 41-106 mm.

17. *Loligo aspera* Ortmann 1888.

Loligo aspera, Ortmann 1888, p. 661, pl. xxv, figs. 3a-3d. (Kôchi, Tosa Prov.).

This species has not been observed since it was first described.

18. *Loligo bleekeri* Keferstein, 1866.

Local name: Yari-ika, Sasa-ika, Saya-naga.

Loligo bleekeri, Keferstein 1866, p. 1402, pl. cxxii, figs. 9, 10; pl. cxxvii, fig. 14 (Japan).—Tryon 1879, p. 149, pl. lvii, figs. 185, 186.—Brock 1882, p. 604.—Appellöf 1886, p. 31, pl. i, figs. 7-10 (Nagasaki).—Ortmann 1888, p. 664.—Joubin 1894, p. 56 (Amboina).—Wülker 1910, pp. 10, 36, pl. iv, fig. 30 (digestive system) (Misaki).—Berry 1912a, p. 399.

List of specimens examined.

Specimens	Locality	Date	Where preserved
1♂	Sagami Bay	Feb. 16, 1901	Sci. Coll.
1♂, 3♀	Satsuma	April 30, 1906	do
1♂	Misaki market	Dec. 1908	do
1♂	Uodzu, Etchû	April 30, 1913	Agr. Coll.
1♂	Namerikawa, Etchû	—	Fish. Inst. Namerikawa
15♂, 46♀	Oshoro, Hokkaidô	July 1, 1913	Agr. Coll.
138 juv.	Namerikawa, Etchû	Aug. 15, 1913	do
6♂, 2♀	Tôkyo market	—	Sci. Coll.

The present species is one of the commonest of this genus. It is distributed from Kiushu to Hokkaidô, in both the Sea of Japan and the Pacific Ocean.

In mature male specimens, the mantle bears a distinct median ridge on the ventral surface. The length of mantle becomes proportionately greater as the animal grows older, as will be seen from the following table:

Mantle-length	Mantle-breadth	Fin-length	Head-length	Length of Longest arm
mm 91 (1)	mm 22 (0.242-)	mm 50 (0.549+)	mm 14 (0.154-)	mm 34 (0.374-)
150 (1)	30.5 (0.203+)	86 (0.573)	20 (0.135-)	51 (0.340)
210 (1)	37 (0.176+)	128.5 (0.612-)	21 (0.100)	58 (0.276+)
280 (1)	40 (0.143-)	182 (0.650)	23.5 (0.084-)	66 (0.236-)
330 (1)	43 (0.130)	225 (0.681)	33 (0.100)	75 (0.227)

Genus *Sepioteuthis* Blainville 1825.19. *Sepioteuthis lessoniana* Férussac 1826.

Local name: Aori-ika (Tôkyo, Etchû), Mizu-ika (Nagasaki).

Sepioteuthis lessoniana, Férussac, in d'Orbigny 1826, p. 155.—d'Orbigny et Férussac 1839, p. 302; *Sepioteuthis*, pl. i; pl. vi, figs. 9-14 (Indian Ocean, New Guinea, Papous, Java, Cape Fabre, Trincomali, Malabar).—d'Orbigny 1845, p. 326.—Gray 1849, p. 80 (New Zealand).—Keferstein 1866, p. 1402, pl. cxxii, fig. 7 (Java).—Tryon 1879, p. 152, pl. lxii, fig. 212; pl. lxiv, fig. 213.—Appellöf 1886, p. 32, pl. i, fig. 11; pl. iii, figs. 11-15 (Nagasaki).—Hoyle 1886, p. 151 (Kandava, Fiji; Ternate).—Ortmann 1888, p. 657 (Tôkyo Bay, Kagoshima).—Joubin 1894, p. 39 (Amboina).—Joubin 1898, p. 26 (Java, Timor, Morotai, Obi Island, Indian Ocean, Cap Haitien).—Wülker 1910, p. 11; anatomy, p. 26, pl. iii, fig. 28; pl. iv, figs. 29, 31 (Misaki).—Berry 1912a, p. 401, pl. vi, figs. 3, 5 (Tsuruga, Echizen Prov.; Misaki; Fusan, Korea; Apia, Samoa).

List of specimens examined.

No.	Specimens	Mantle-length	Locality	Date	Where preserved
i	7♂	—	Tôkyo market	Aug. 1885	Sci. Coll.
ii	1♂	107 mm	Ôshima, Izu	April 1887	do
iii	1♂	—	Namerikawa, Etchû	June 1889	do
iv	5♂, 3♀	—	Kagoshima market	April 17, 1896	do
v	1♂	200 mm	Miyazu, Tango	July 8, 1903	do

No.	Specimens	Mantle-length	Locality	Date	Where pre-served
vi	1♂, 2♀	193-255 mm	Misaki	Aug. 1906	do
vii	1♂	10 mm	Nagasaki	April 1912	Agr. Coll.
viii	1♂	330 mm	Asari, Hokkaidô	July 1911	do
ix	1♂	355 mm	Namerikawa	July 19, 1913	Fish. Inst. Namerikawa
x	1♂	207 mm	Enoura, Suruga	—	Sci. Coll.
xi	1♂	—	Haneda, Musashi	—	do
xii	4♂, 2♀	—	Takamatsu, Sanuki	—	do
xiii	1♂	—	Bonin Isl.	—	do

The horny teeth of arm-suckers in specimens Nos. ix and x are not conical as usual, but are somewhat laterally flattened.

20. *Sepioteuthis sieboldi* Joubin 1898.

Sepioteuthis sieboldi, Joubin 1898, p. 27 (Waigeou; Japan) — Berry 1812a, p. 404.

This species has not yet come under my observation.

21. [*Sepioteuthis brevis* Owen 1881.]

Sepioteuthis brevis, Owen 1881, p. 137, pl. xxvi, fig. 1 (Japanese Sea).—Wülker 1910, p. 11.

This is at best a doubtful species.

22. [*Sepioteuthis sinensis* d'Orbigny, 1839.]

Sepioteuthis sinensis d'Orbigny, in d'Orb. et Férussac 1839, p. 304.—d'Orbigny 1845, p. 329.—Tryon 1879, p. 154.

This name was applied by d'Orbigny to a cuttle-fish said to be salted and dried for eating by Japanese, who should call it Ta-tsi-i-ka.

Fam. SEPIIDÆ Steenstrup 1861.

Genus *Sepia* Linneus 1758.

23. *Sepia torosa* Ortmann, 1888.

Sepia torosa, Ortmann 1888, p. 652, pl. xxiii, fig. 2 (Tôkyo Bay).—

Ortmann 1891, p. 674 (Amboina).—Berry 1912a, p. 420.

One ♀ specimen was collected by Prof. K. Mitsukuri at Akune, Satsuma Prov., April 19, 1896 (Sci. Coll.). Mantle-length¹⁾ 143 mm. It agrees well with the description of Ortmann, except in the fact that the horny ring of arm-suckers is nearly entire in the margin—so at least in the proximal suckers—instead of being provided with distinct teeth.

24. *Sepia formosana* Berry 1912.

Sepia formosana, Berry 1912a, p. 420, pl. ix, fig. 7 (Takao, Formosa).

Not yet come to the observation of the author.

25. *Sepia aculeata* Van Hasselt 1834.

Sepia aculeata Van Hasselt MS., in d'Orbigny et Férussac 1834,

p. 287; Seiches, pls. v & xxv (Indian Ocean., Java).—

d'Orbigny 1845, p. 295.—Gray 1849, p. 105—Steenstrup

1875, p. 473, pl. ii, fig. 4.—Tryon 1879, p. 195, pl. xc, fig.

415; pl. xci, figs, 416, 417.—Goodrich 1896, p. 3 (Irawaddy

1) With regard to the genus *Sepia*, the term "mantle-length," is employed to designate the length from the posterior end of body to the anterior margin of mantle as measured on the dorsal side, in exclusion of the length of rostrum which is often found to be worn away.

delta ; Port Blair ; Andaman Sea).—Joubin 1898, p. 25 (St. Vincent ; Nassau harbor ; Bahama).—Wülker 1910, p. 11 (Misaki).—Berry 1912a, p. 418 (Tsuruga, Echizen).

Japanese specimens of this species have not come under observation of the author.

26. *Sepia subaculeata* sp. nov.

Pl. XII., figs. 6, 7.

Diagnosis. Body large ; mantle short, oval, broadest near the middle, bluntly pointed behind. Head small. Arm subequal in length, the order of their length being 4, 1, 2, 3 ; the longest arm shorter than half the length of mantle. Arm-suckers arranged distinctly in four series in the whole extent of every arm ; horny ring generally entire, except in suckers in terminal parts of arms, where it shows numerous bluntly pointed teeth. Buccal membrane provided with from two to five small suckers on every projection of margin. Tentacles longer than head and mantle combined, provided with suckers in distal one-fifth of their length. Tentacular suckers nearly equal in size, arranged in eight series ; horny ring finely toothed.

Shell broad, elongate-elliptical in outline, rounded at both extremities ; dorsal surface moderately convex ; ventral surface arched in the middle, provided with a deep median groove which is deepest in the anterior part of the striated area ; anterior boundary line of the striated area shows two straight lines meeting each other at an acute angle. Inner cone well developed, with very thick rim. Rostrum very small. Locular index 34 in male.

Four specimens purchased at the fish market in Tokyo, Nov. 1882 (Sci. Coll.). Dimensions of typical male and female adult specimens (in alcohol) as follows :

	Male mm.	Female mm.
Dorsal length of mantle	210	215
Ventral length of mantle	165	164
Breadth of mantle	110	110
Mantle-extent from fin in side	5	2
Breadth of fin	23	25
Length of first arm (right)	91	90
„ „ second arm (do)	89	88
„ „ third arm (do)	80?	88
„ „ fourth arm (do)	92	94
„ „ tentacle (do)	310	400
Diameter of largest arm-sucker	3	3
„ „ tentacular sucker	1.5	1.5
Breadth of shell	80	80

Remarks. The species standing in nearest relationship to the present one is *S. aculeata* Van Hasselt. The two species differ from each other in following respects:

	<i>Sepia subaculeata.</i>	<i>Sepia aculeata.</i>
Arm-order :	4, 1, 2, 3,	4, 3, 2, 1.
Posterior end of mantle :	bluntly terminating,	somewhat acuminate.
Tentacular stalk :	thick,	somewhat thin.
Tentacular suckers :	somewhat large, being arranged in 8 longitudinal series,	small, being arranged in 10 or 12 alternate series.
Dorsal surface of shell :	without a distinct longitudinal furrow,	with 4 longitudinal furrows.
Ventral surface of shell :	with a deep median furrow,	without a median furrow.
Rostrum of shell :	very short and thin,	long and thick.

27. *Sepia esculenta* Hoyle 1885.

Sepia esculenta, Hoyle 1885a, p. 188 (Yokohama market).—Hoyle 1885b, p. 291.—Appellöf 1886, p. 28, pl. iii, figs. 1-6 (Nagasaki).—Hoyle 1886, p. 129, pl. xvii, figs. 1-5; pl. xviii, figs. 1-6.—Ortmann 1888, p. 649 (Tôkyo Bay).—Joubin 1897, p. 102 (Local. ?).—Pilsbry 1895, p. 2 (Yokohama).—Hedley 1906, p. 463 (Queensland).—Berry 1912a, p. 418 (Tôkyo).

List of specimens examined.

No.	Specimens	Mantle-length	Locality	Date	Where preserved.
i	14♂, 2♀	130 mm in largest ♂ 125 mm in largest ♀	Tôkyo market	Sept. 1885	Sci. Coll.
ii	1♀	159 mm	Miyazu, Tango	—	do
iii	1♀	110 mm	Tomo, Bingo	—	Fish. Bur.
iv	1 juv.	—	Amakusa, Higo	—	Imp. Mus.
v	1 juv.	—	Tosa	—	do
vi	3♂, 3♀	—	Haneda, Musashi	—	do
vii	1♂	100 mm	Gokashô, Ise	July 1910	Agr. Coll.
viii	1♂	9 mm	Misaki	—	do
ix	2♀	—	Himi, Etchû	May 9, 1913	do

There exist individual variations in the shape of shells, these in some cases being broader, the median furrow on its ventral surface shallower, and the locular index smaller, than in others.

28. *Sepia elliptica* Hoyle 1885.

Local name: Hari-ika (Tôkyo).

Pl. XI., figs. 11, 12.

Sepia elliptica, Hoyle 1885a, p. 189 (Arafura Sea, South of Papua).—Hoyle 1885b, p. 293.—Hoyle 1886, p. 131, pl. xix, figs. 14-24.—Wülker 1910, p. 11 (Misaki).—Berry 1912a, p. 419.

Sepia hoylei, Ortmann 1888, p. 650, pl. xxii, fig. 5; pl. xxiii, fig. 1 (Maizuru; Tôkyo Bay; Katsiyama, Awa; Enoshima, Sagami; Kochi, Tosa; Kagoshima).—Berry 1912a, p. 419 (Nagasaki; Wakanoura).

List of specimens examined.

Specimens	Locality	Date	Where preserved
1♂, 1♀	Akune, Satsuma	April 19, 1896	Sci. Coll.
7	Tôkyo market	—	do
3♂, 3♀	Tôkyo Bay	—	Imp. Mus.

Ventral sculpture of the shell is subject to considerable individual variations, which are however connected together by intermediate gradations, indicating, as Wülker has recently pointed out, that *S. hoylei* and *S. elliptica* should be taken for synonyms. Plate I, figs. 11 and 12 show two extreme cases of the variation among the specimens now before me.

29. *Sepia hercules* Pilsbry 1894.

Sepia hercules, Pilsbry 1894, p. 144 (Japan).—Pilsbry 1895, p. 2, pl. i, figs. 1, 2 (Loocho Island).—Berry 1912a, p. 419.

Only a shell of this species came under my observation. It was collected by Mr. K. Aoki in the neighbourhood of Misaki, May, 1899. Length about 420 mm; the surface beset with groups of *Lepas*.

30. *Sepia myrsus* Gray 1849.

Sepia myrsus, Gray 1849, p. 108 (China).—Hoyle 1886, p. 219 (Japanese region).

This species has been mentioned with doubt by Hoyle (1886) in his list of the Japanese Cephalopod fauna.

Subgenus **DORATOSEPION** (de Rochebrune 1884).

31. *Sepia* (*Doratossepion*) *andreana* Steenstrup 1875.

Local name: Hari-ika (Chôshi, Shimo-osa).

Sepia andreana, Steenstrup 1875, p. 474, pl. i, figs. 11-19 (Japan).

—Tryon 1879, p. 193, pl. lxxxix, fig. 408; pl. xc, figs. 409, 410.—Wülker 1910, pp. 19, 22, 24.

Doratossepion andreana, de Rochebrune 1884, p. 96.

Sepia (*Doratossepion*) *andreana*, Berry 1912a, p. 422.

List of species examined.

Specimens	Mantle-length	Locality	Date	Where preserved
6♂	95 mm in largest one	Awa	April 20, 1906	Sci. Coll.
1♂	88 mm	Hakodate?, Hokkaido	—	Agr. Coll.
11♂, 1♀	—	Chôshi, Shimo-osa	—	Imp. Mus.

Arms of the second pair in the males are considerably thicker than are represented by Steenstrup in his figure (1875, pl. I, fig. 11).

32. *Sepia (Doratossepion) andreanoides* Hoyle 1885.

Sepia andreanoides, Hoyle 1885a, p. 193 (Yokohama market).

—Hoyle 1885b, p. 297.—Hoyle 1886, p. 139, pl. xxi, figs.

11-19; pl. xxii, fig. 11.—Ortmann 1888, p. 653 (Tôkyo Bay).

—Pilsbry 1895, p. 3. (Ika? coast).—Joubin 1897, p. 102

(Nagasaki).—Wülker 1910, pp. 19, 22, 24.

Sepia (Doratossepion) andreanoides, Berry 1912a, p. 423.

List of specimens examined.

No.	Specimens	Mantle-length	Locality	Date	Where pre-served
i	2 ♂	81 mm in each	Tôkyo market	Sept. 1885	Sci. Coll.
ii	6 ♂	105 mm in largest one	Tôkyo market	April 1906	do
iii	5 ♂	195-82 mm	Isohama, Ibaraki Pref.	May 15, 1912	Agr. Coll.

The specimens No. ii differ from those of No. i in the mantle being more slender, in the ventral arms being shorter and in the shell being narrower.

33. *Sepia (Doratossepion) pardalis* sp. nov.

Pl. XII., figs. 1-3.

Diagnosis. Body large; mantle elongate-elliptical in outline, with about one hundred streak-like spots on back, arranged more or less symmetrically on both sides of the median line.

Arms comparatively short, unequally long, the order of their length being 1, 2, 3, 4; first arm shorter than half the length of mantle and very thin in the distal half. Arm-suckers in the distal half of first arm and in the distal one-third of second and third arms arranged in two series; same in the proximal parts of first, second and third arms as well as in the whole extent of fourth arm in four

series; horny ring of distal suckers with long blunt teeth separated by distinct interspaces; that of proximal suckers nearly entire owing to close approximation of teeth.

Hectocotylization in the distal one-third of left ventral arm, normal suckers forming about seventeen transverse rows in the proximal part.

Tentacles shorter than dorsal length of mantle. Tentacular suckers small and equal in size, arranged in eight series, with long teeth in the distal part of horny ring.

Shell very narrow, lanceolate in outline, with small discoidal outer cone. Its dorsal surface strongly convex, with a arched median area marked off on each side by a deep groove from lateral parts. Ventral surface slightly convex anteriorly, with an irregularly running median groove. Striated area marked with numerous longitudinal streaks; its anterior border deeply indented. Inner cone somewhat developed, but with thin rim. Locular index about 30.

Type. A male alcoholic specimen obtained at Kajiyama, Awa Prov., Feb. 9, 1889. Dimensions as follows (paired organs measured on the right side):

	mm.
Dorsal length of mantle	231
Ventral length of mantle.....	210
Breadth of mantle.....	75
Breadth of head.....	53
Breadth of fin.....	13
Length of first arm	95
„ „ second arm	83
„ „ third arm.....	80
„ „ fourth arm	63
„ „ tentacle	190
Diameter of largest arm-sucker	1.5
„ „ tentacular sucker.....	0.5

Remarks. This species stands in nearest relationship to *S. andreanoides* Hoyle, but differs from this in the following points: The mantle is twice as large as that of *S. andreanoides* (as compared in fully mature specimens). The horny ring of distal arm-suckers is distinctly denticulated, while in *S. andreanoides* it presents a smooth edge. The dorsal surface of mantle is marked with large brown spots which are absent in the latter species. The tentacles are less slender, while the shell is on the ventral surface only slightly convex instead of being strongly so and the median groove irregularly running, not straight.

34. *Sepia (Doratosepion) tokyoensis* Ortmann 1888.

Local name: Suji-ika (Awa).

Sepia tokyoensis, Ortmann 1888, p. 653, pl. xxiii, fig. 3 (Tôkyo Bay).—Wülker 1910, p. 14 (Misaki).

Sepia (Doratosepion) tokyoensis, Berry 1912a, p. 423 (Aomori).

List of specimens examined.

Specimens	Mantle-length	Locality	Date	Where preserved
6♂	30-74 mm	Tôkyo market	—	Sci. Coll.
10♂	68-88 mm	Gyôtoku, Shimo-osa	April 20, 1906	Sci. Coll.
3♂	—	Awa	—	Imp. Mus.

In dimensions the above specimens agree well with Ortmann's, but differ from these in the following respects: 1) The longest arm is the first and the shortest the fourth, while in Ortmann's specimens the two were equally long. 2) The distal parts of all the arms are rather thick and not so thin as in the latter. 3) Distal suckers on each arm arranged distinctly in four series, while in Ortmann's specimens, they were nearly in two series. 4) Locular index is 26-33,

while Ortmann gave it to be 36-40.5). Finally, the fin is specially thickened at the posterior end, a fact not mentioned by Ortmann but which constitutes an important diagnostic character, in as much as it serves to distinguish at once the species from any other of the genus.

35. *Sepia (Doratosepion) misakiensis* Wülker 1910.

Sepia misakiensis, Wülker 1910, p. 15, figs. 5, 6, 19-22 (Misaki; Entrance of Uraga channel).

Sepia (Doratosepion) misakiensis, Berry 1912a, p. 424.

One ♂ specimen obtained by Prof. K. Mitsukuri at Misaki, May 1902 (sci. Coll.). Mantle-length 67 mm.

One ♂ specimen, Misaki (Sci. Coll.). Mantle-length 67 mm.

36. *Sepia (Doratosepion) kubiensis* Hoyle 1885.

Sepia kubiensis, Hoyle 1885a, p. 195 (Kôbe Bay).—Hoyle 1885b, p. 300.—Appellöf 1886, p. 20, pl. iii, fig. 7 (Nagasaki).—Hoyle 1886, p. 142, pl. xviii, figs. 7-14.—Ortmann 1888, p. 654 (Maizuru, Tango; Kajiyama, Awa; Kagoshima; Tôkyo Bay).—Hoyle 1902, p. 982 (Kolumadulu Atoll).—?, Wülker 1910, p. 16 (Misaki).

Sepia (Doratosepion) kubiensis, Berry 1912a, p. 423 (Nagasaki; Hakodate; Hizen?).

Two ♀ specimens obtained by K. Mitsukuri at Enoura, Suruga Prov., April 1884 (Sci. Coll.). Mantle-length 87 mm., 77 mm. The characters agree well with Hoyle's description of the Challenger specimen; only the posterior end of the fin does not reach the ventral surface of mantle, as it did in the Challenger specimen, but extends straight on toward the posterior mantle-end as usual in this genus.

This is a very variable species, as is shown by the fact that the descriptions of it given by Hoyle, Ortmann, Appellöf and Wülker disagree with one another in some points. The specimens which I examined always showed some discrepancy from the descriptions

given by the above authorities. Some of the specimens seemed to stand in very close relationship to *S. kiensis* Hoyle.

37. *Sepia* (*Doratosepion*) *peterseni* Appellöf 1886.

Local name: Shishi-ika (Nagasaki).

Sepia peterseni, Appellöf 1886, p. 23, pl. ii, figs. 1-6; pl. iii, fig. 21 (Nagasaki).—Wülker 1910, p. 14 (Misaki).

Sepia (*Doratosepion*) *peterseni*, Berry 1912a, p. 423.

List of specimens examined.

Specimens	Locality	Date	Where preserved
10♂	Mikawa	—	Sci. Coll.
1♂	Kagoshima market	May 29, 1886	do
14♂	Tôkyo market	—	do
6♂	Isé	—	Imp. Mus.
1♂	Nagato	—	do
5♂	Nagasaki	—	Agr. Coll.

38. *Sepia* (*Doratosepion*) *appellöfi* Wülker 1910.

Sepia appellöfi Wülker 1910, p. 14, figs. 8, 15-18 (Misaki).

Sepia (*Doratosepion*) *appellöfi*, Berry 1912a, p. 424.

- i. One ♀ specimen purchased by Prof. K. Mitsukuri at Akune, Satsuma Prov. April 1896 (Sci. Coll.). Mantle-length 89 mm.; arm-order 1, 2, 3, 4.
- ii. Five young specimens, Tôkyo market (Sci. Coll.). One of them, a male, is 60 mm. in mantle-length, the arm-order being 4, 1, 2, 3. The remaining four specimens of un-

determinable sex up to 57 mm. in mantle-length.

- iii. One ♀ specimen, Misaki (Sci. Coll.). Mantle-length 74 mm.; arm-order 1, 4, 3, 2.
- iv. A male from unknown locality (Sci. Coll.), in which the fourth arm is the longest.

All these specimens agree closely with the description by Wülker except in the arm-order and in the horny ring of tentacular suckers having 15–20 short and blunt teeth instead of being quite entire. The teeth are sometimes very indistinct, but can always be easily distinguished from the horny papillae of the papillary area.

39. *Sepia* (*Doratosepion*) *lorigera* Wülker 1910.

Sepia lorigera, Wülker 1910, pp. 12, 13. figs. 3, 4, 10–14 (Misaki).

Sepia (*Doratosepion*) *lorigera*, Berry 1912, p. 422.

- i. Three ♂ and four ♀ specimens, Tòkyo market (Sci. Coll.). Mantle-length 220 mm. in the largest male and 148 mm. in the largest female. In the female, the first arms are not so noticeably elongate, nor their extremities so much enlarged, as in the male.
- ii. Three ♂ specimens, obtained by Prof. S. Watasé in the Tòkyo market, April 20, 1906 (Sci. Coll.). Mantle-length 190 mm. in the largest individual.
- iii. One ♀ specimen, Isé Prov. (Imp. Mus.).

40. *Sepia* (*Doratosepion*) *longipes* sp. nov.

Pl. XII., figs. 4. 5.

Diagnosis. Body large; mantle broad, oval in outline. Arms in male much unequal, very long, the order of their length being 1, 2, 3, 4, and the longest arm being about twice as long as the length of mantle. Hectocotylyzation in the distal two-fifths of the left ventral arm; similarly hectocotylyzed also was the distal one-third

of the right ventral arm. Arms in female subequal, the order of their length being 2, 1, 3, 4; the second arm shorter than mantle-length. Arm-suckers arranged in four longitudinal series in the proximal part of each arm, and in two series in the distal part; horny ring entire. Tentacles thick and long, about twice as long as the ventral length of mantle; tentacular suckers arranged in eight longitudinal series and in markedly oblique transverse rows; their size greatly unequal, four suckers in dorsal submedian series being much larger than the rest; horny ring of the smaller suckers with numerous long teeth on edge.

Shell lanceolate, with small discoidal outer cone at the posterior extremity; dorsal surface convex, with an arched median area marked off on each side by a distinct groove; ventral surface convex in the anterior, and concave in the posterior parts, with a prominent ridge along the median line; last locular boundary of a V-like shape with the pointed end turned backwards; inner cone slightly developed. Locular index about 40.

Two ♂ and four ♀ specimens were obtained by Prof. S. Watasé at Chôshi, Kazusa Prov., on August 18, 1906 (Sci. Coll.). Mantle-length of largest male 235 mm., that of largest female 178 mm.

Dimensions of typical male and female specimen (in alcohol), as follows:

	Male mm.	Female mm.
Dorsal length of mantle	220	147
Ventral length of mantle	170	116
Breadth of mantle	155	75
Breadth of head	75	50
Breadth of fin	15	14
Length of first arm	420	105
„ „ second arm	210	120
„ „ third arm	140	90
„ „ fourth arm	140	70

	Male mm.	Female mm.
Length of tentacle	355	270
Diameter of largest arm-sucker	3.5	2.5
„ „ largest tentacular sucker	8	6

Genus *Metasepia* (Hoyle 1885).

41. *Metasepia tullbergi* (Appellöf 1886).

Local name: Hana-ika (Nagasaki).

Sepia tullbergi, Appellöf 1886, p. 26, pl. ii, figs. 7-14 (Nagasaki).

Sepia (Metasepia) tullbergi, Ortmann 1888, p. 656 (Kajiyama, Awa Prov.; Kagoshima).—Joubin 1897, p. 103 (Nagasaki).

Metasepia tullbergi, Berry 1912, p. 424.

Two ♂ specimens, Nagasaki, April 1910 (Agr. Coll.). Mantle-length 36 mm. in each.

Genus *Sepiella* steenstrup 1880.

42. *Sepiella maindroni* de Rochebrune 1884.

Local name: Ma-ika (Tosa).

Textfigure 1.

Sepiella maindroni, de Rochebrune 1884, p. 89 (Pondicherry).—

Hoyle 1886, p. 149, pl. xxii, figs. 1-10 (Inland Sea).—Wülker 1910, p. 20 (Misaki).—Berry 1912a, p. 424.

List of specimens examined.

Specimens	Mantle-length	Locality	Date	Where preserved
1♂, 1♀	130 mm. in each	Natagiri, Sagami	—	Sci. Coll.
1 juv. ♂?	68 mm.	Nagasaki	—	do

Specimens	Mantle-length	Locality	Date	Where preserved
1♂	110 mm.	Tomo, Bingo	—	Fish. Bur.
1♂, 5♀	—	Haneda, Musashi	—	Imp. Mus. Tôkyo
1♀	—	Tosa	—	do
10♂	124 mm., 112 mm.	Himi, Etchû	May 9, 1913	Agr. Coll.



Textfigure 1.
Hectocotylus of
Sepiella maindroni de Roch.

The species is very closely allied to the following *Sepiella inermis*, but differs from this in the proximal part of the hectocotylus being provided with forty or more, instead of only twenty, small suckers (Textfig. 1).

43. *Sepiella inermis* (Van Hasselt 1839).

Sepia inermis Van Hasselt MS., in d'Orbigny et Férussac 1839, p. 286, Seiches, pl. vi bis; pl. xx, figs. 9, 10 (Indian Ocean; Batavia, Bombay, Pondicherry, Coromandel).—d'Orbigny 1845, p. 295, pl. xii, figs. 9, 10.—Steenstrup 1875, pp. 475, 478, pl. ii, fig. 3.—Tryon 1879, p. 196, pl. xci, fig. 423; pl. xcii, figs. 424, 425.

Sepia microcheirus, Gray 1849, p. 107 (India).

Sepiella inermis, Steenstrup 1880, pp. 347-356, figs. 1-8.—Goodrich 1896, p. 5 (Madras, near Bombay, Sandheads, Chilka Bight, Mergui, Singapore, Penang, off the Ganjam coast).—Joubin 1897, p. 103 (Nagasaki).—Joubin 1898, p. 25 (Timor).—Hoyle 1905, p. 982, fig. 152 (Hulule, Male Atoll).—Berry 1912a, p. 424.

In the various Japanese collections I have had access to, I have never yet come across a specimen which could be identified with this species.

44. [*Sepiella? sinensis* d'Orbigny 1839.]

Sepia sinensis, d'Orbigny, in d. Orb. et Fer. 1839, p. 289, Seiches, pl. ix, figs. 1, 2.—Berry 1912a, p. 417.

Sepia inermis, Gray 1849, p. 104.—Tryon 1879, p. 169.

Sepiella? sinensis is the name given by d'Orbigny to a squid said to stand described in a Japanese encyclopaedic work, the exact title of which remains unknown and which therefore can not be consulted with.

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Explanation of Plates.

Plate XI. Fig. 1. Arms of a male specimen of *Euprymna morsei* (Verrill), $\times 5$.

Fig. 2. Largest sucker of second arm of the same, $\times c 18$.

Figs. 3, 4. Tentacular suckers of the same, $\times 390$.

Fig. 5. Arms of a male specimen of *Euprymna similis* sp. nov., $\times 2$.

Fig. 6. Largest sucker of second arm of the same, $\times c 22$.

Figs. 7, 8. Tentacular suckers of the same, $\times 370$.

Fig. 9. A male specimen of *Inioteuthis parva* sp. nov. $\times 3$.

Fig. 10. Hectocotylus of the same, $\times 5$.

Figs. 11, 12. Shells of *Sepia elliptica*, nat. size.

Plate XII. Fig. 1. *Sepia pardalis* sp. nov., $\times 2/3$.

Fig. 2. Tentacular club of the same, nat. size.

Fig. 3. Shell of the same, nat. size.

Fig. 4. A male specimen of *Sepia longipes* sp. nov., $\times 1/2$.

Fig. 5. Shell of same species, nat. size.

Fig. 6. Shell of *Sepia subaculeata* sp. nov., $\times c. 1/2$. a) ventral view; b) dorsal view.

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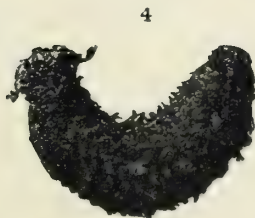
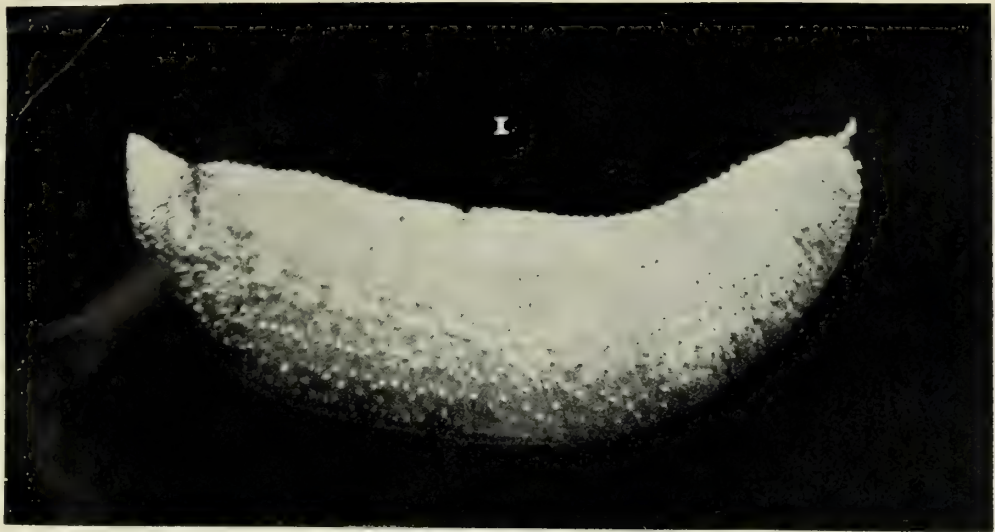
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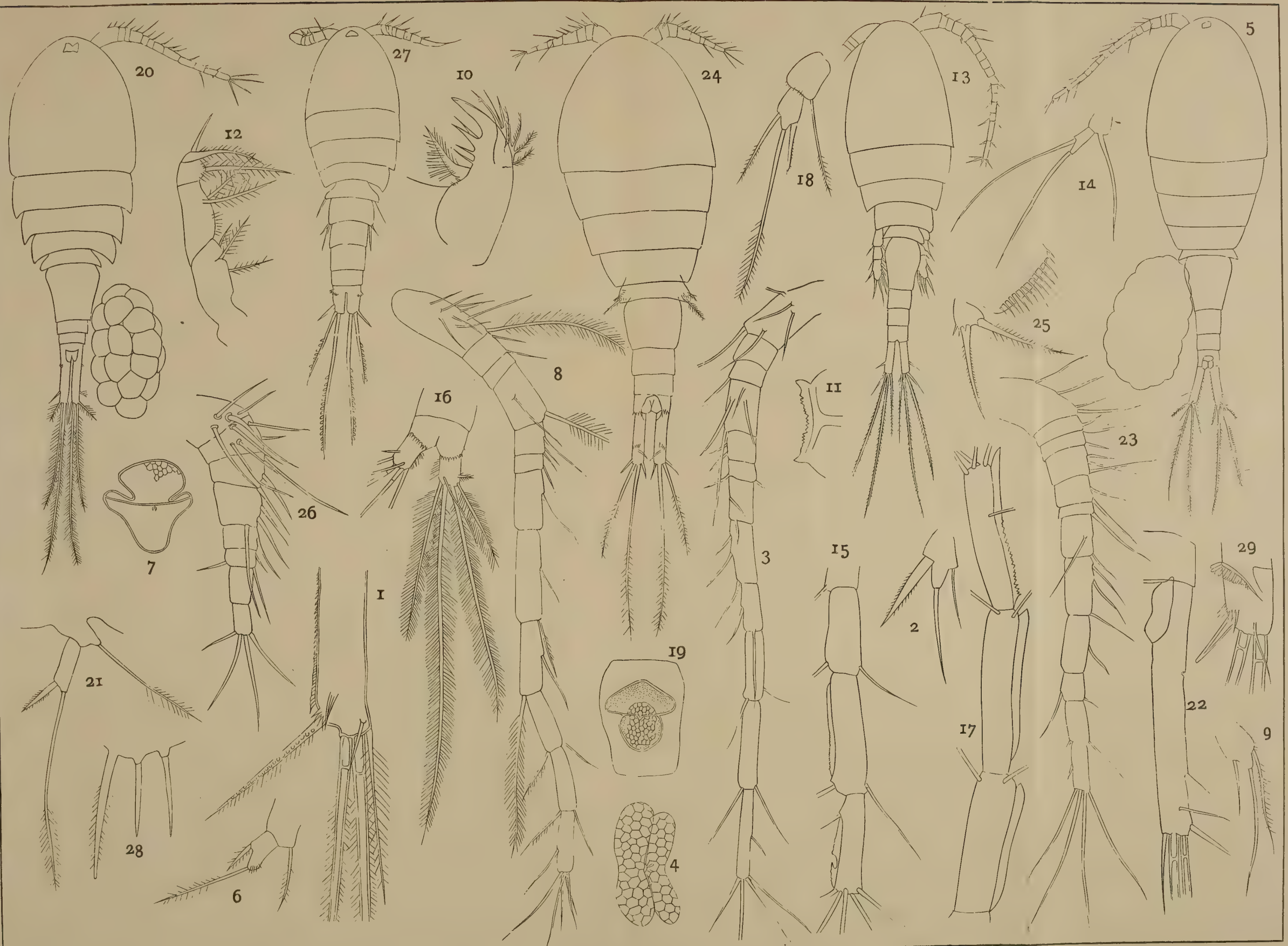
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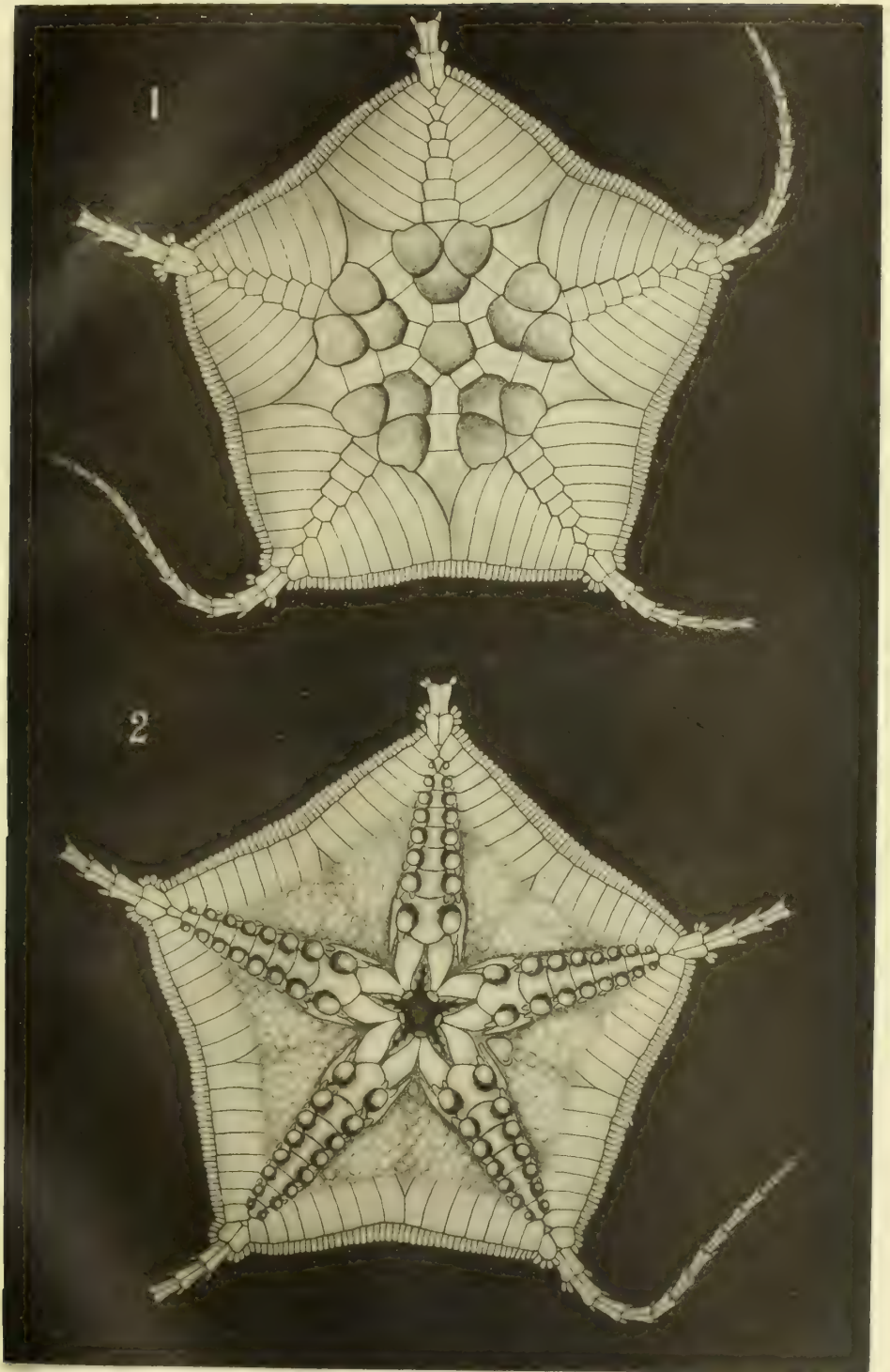
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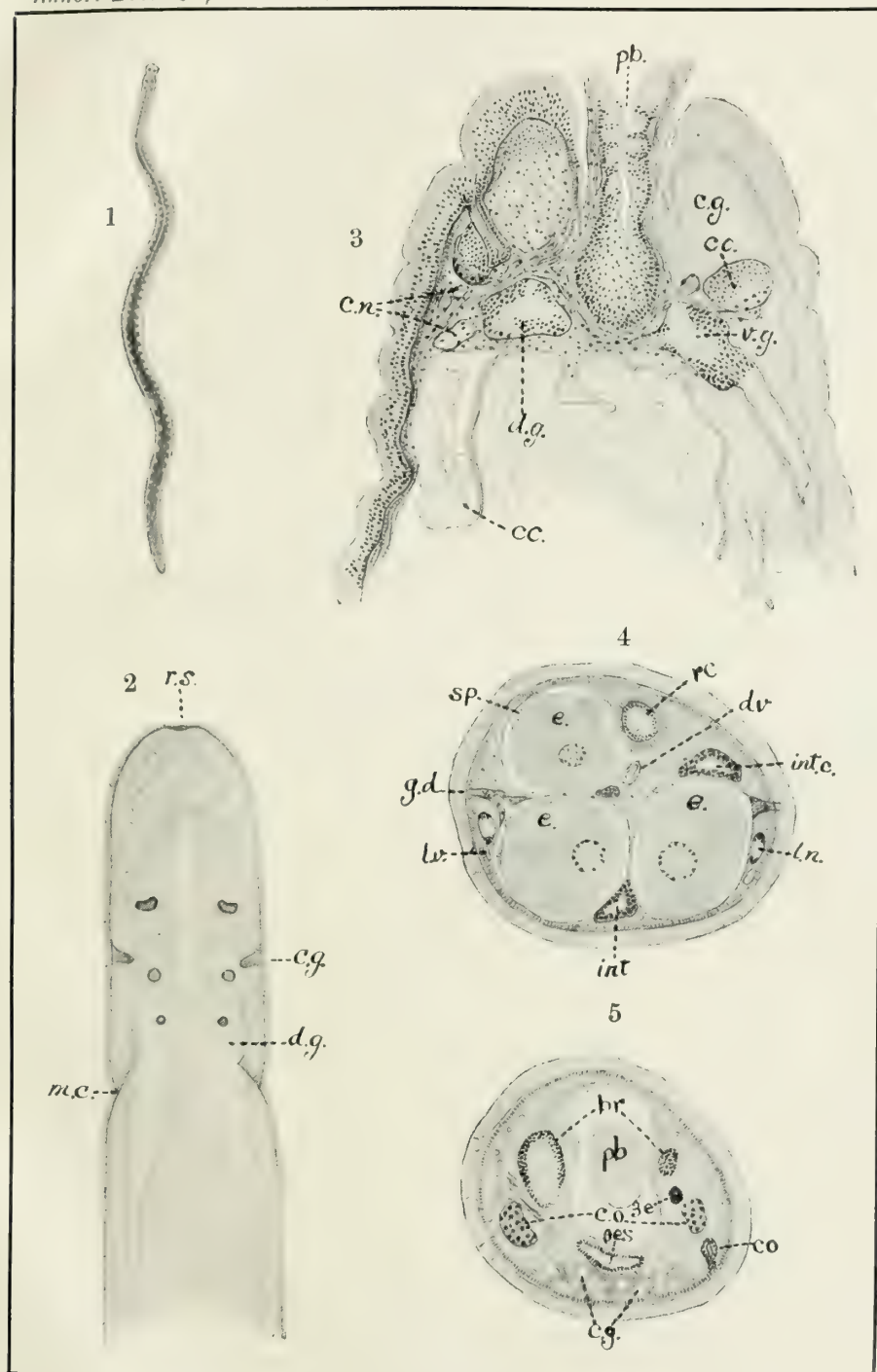
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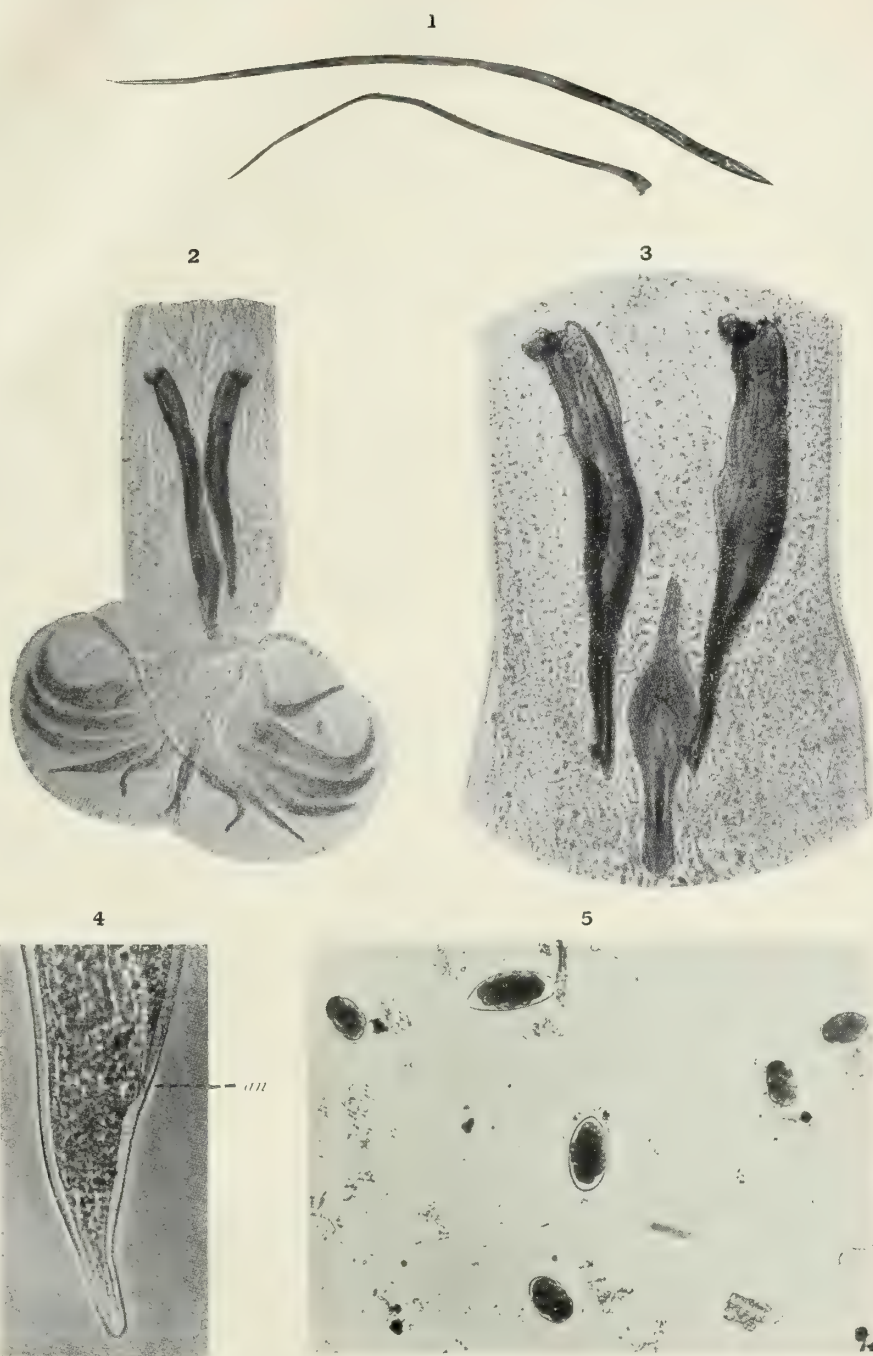




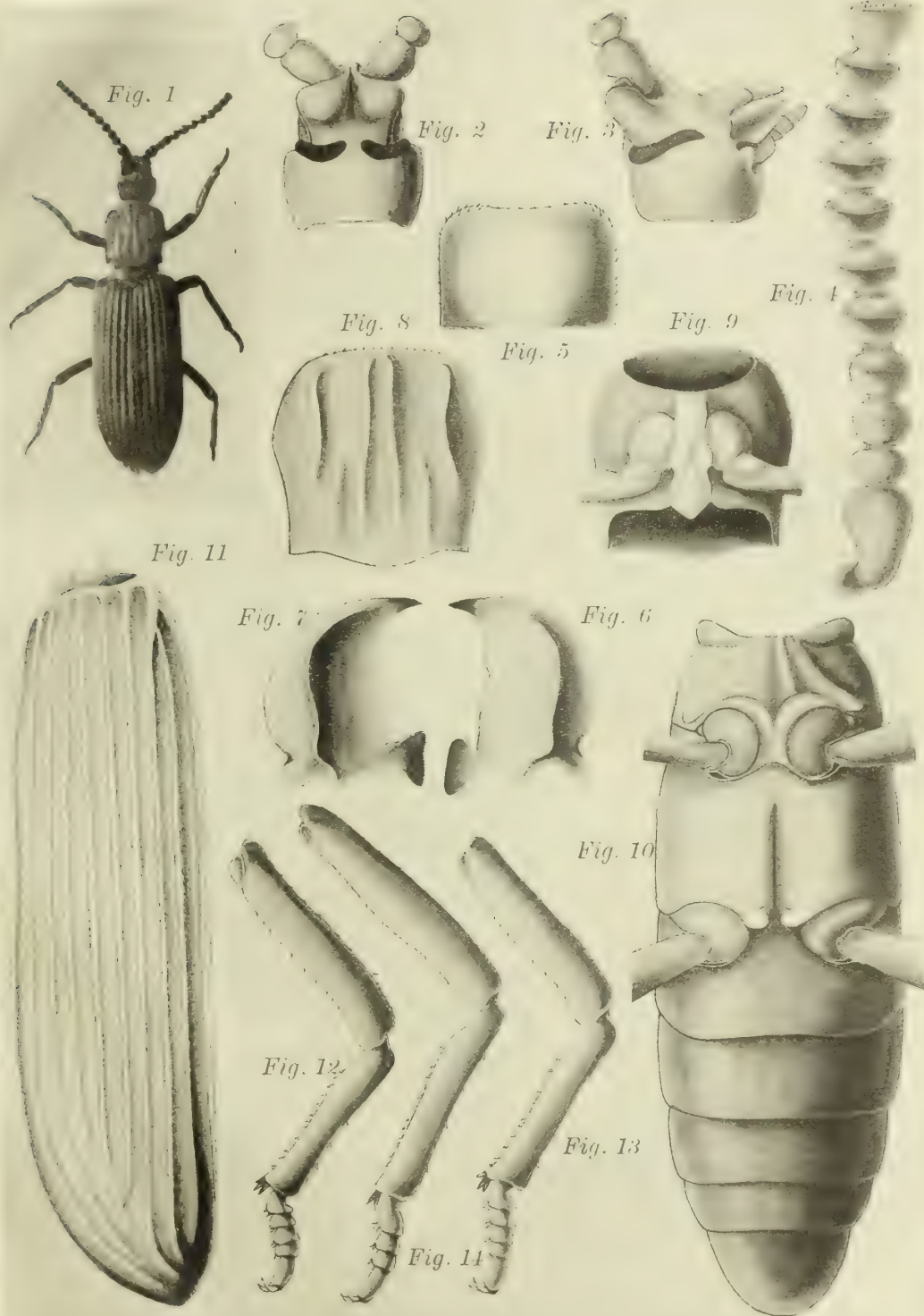
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I. Ikeda : *Stichostemma grandis* n. sp.

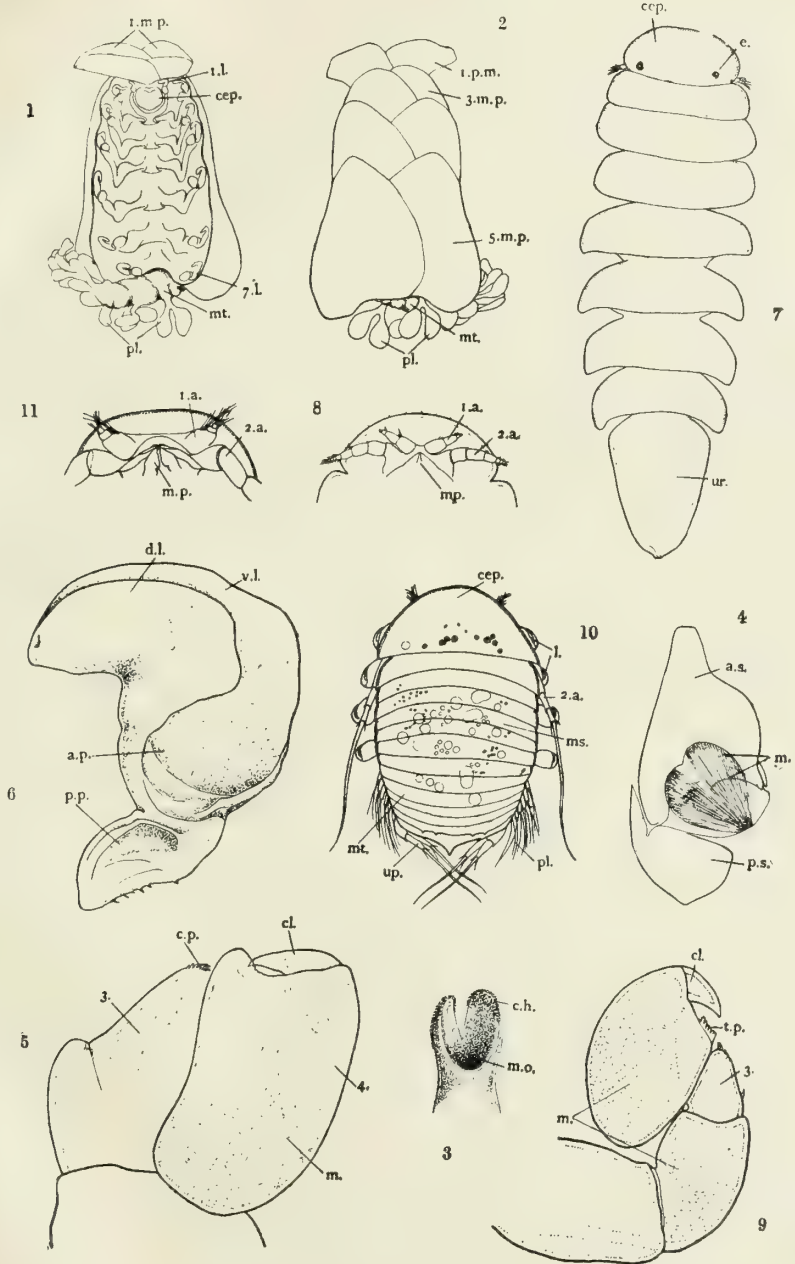


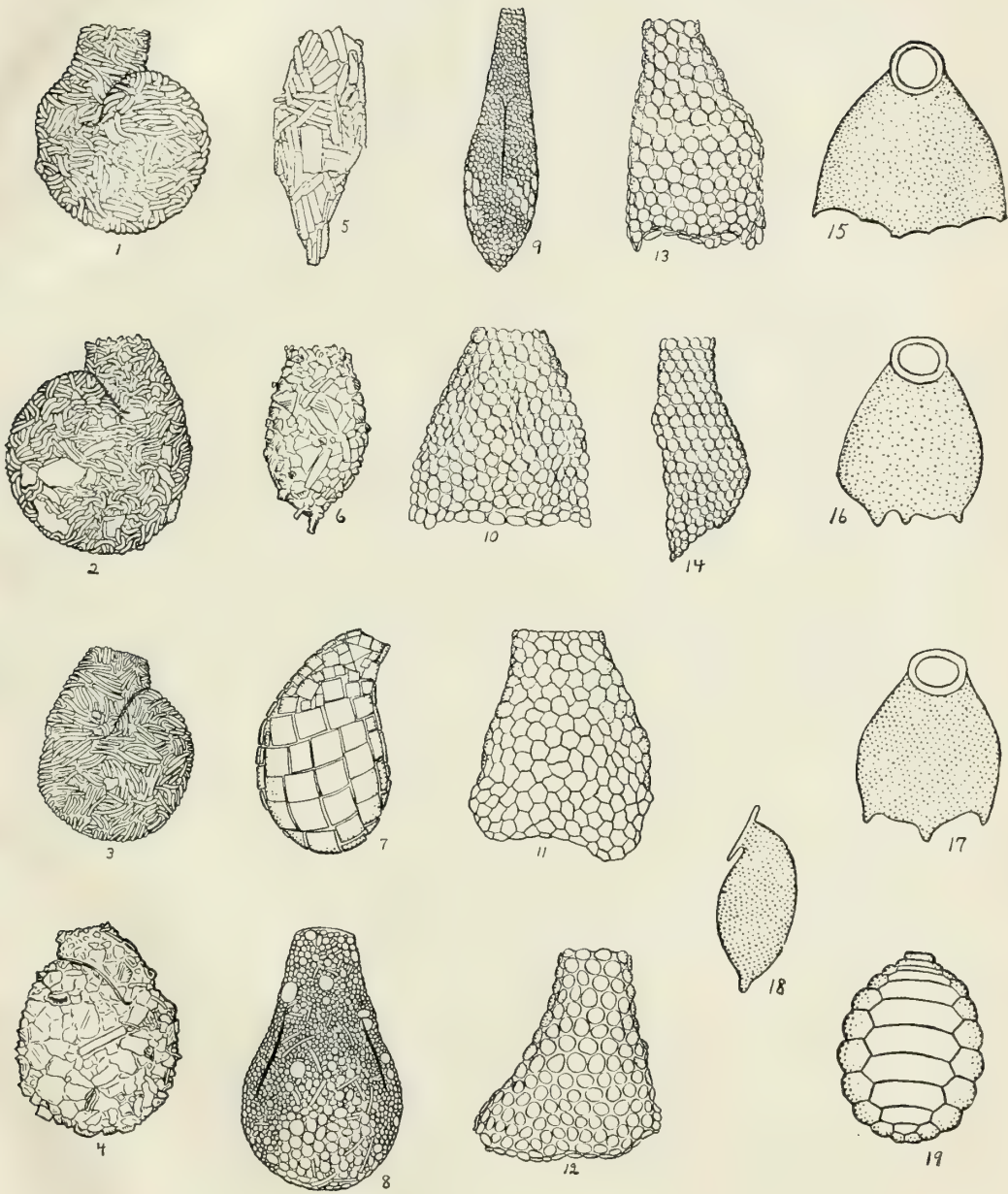
K. Jimbo: *Trichostrongylus orientalis* n. sp.



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Ziaelas formosanus, n. sp.





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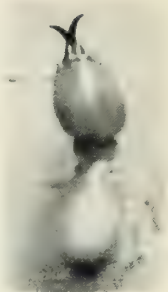
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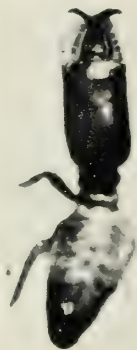
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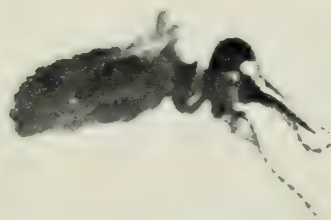
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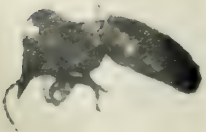
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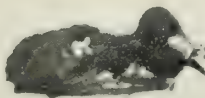
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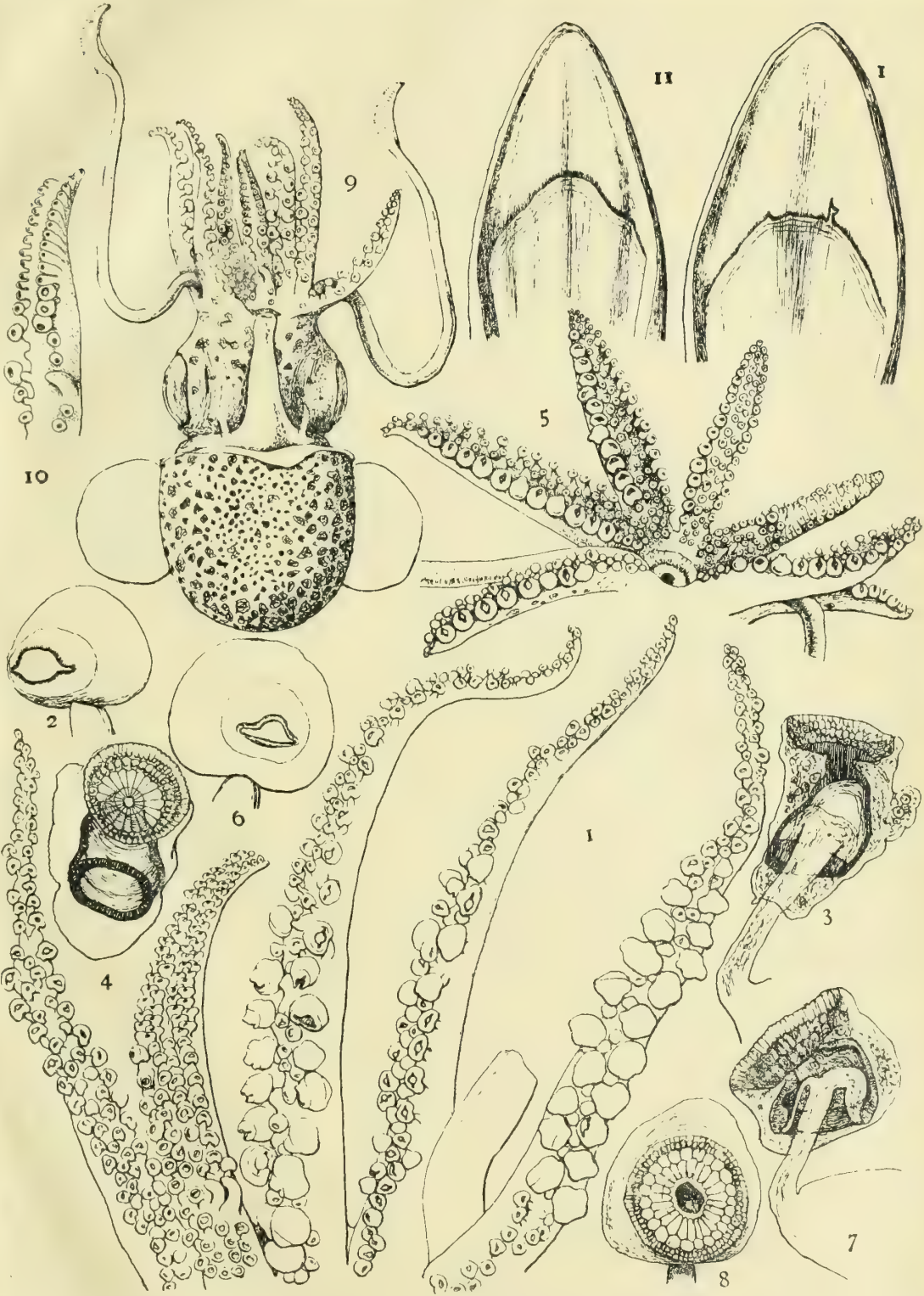


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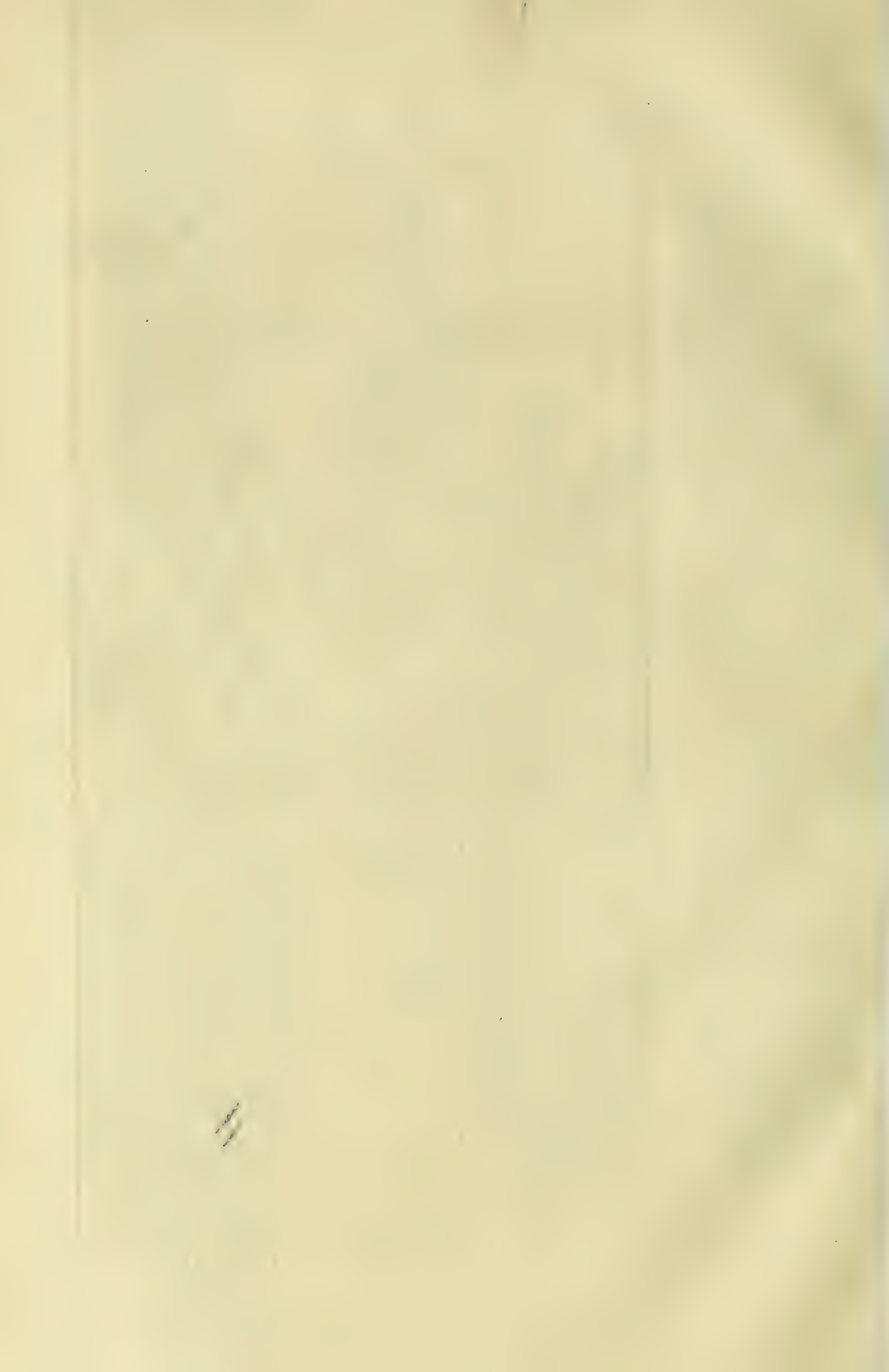


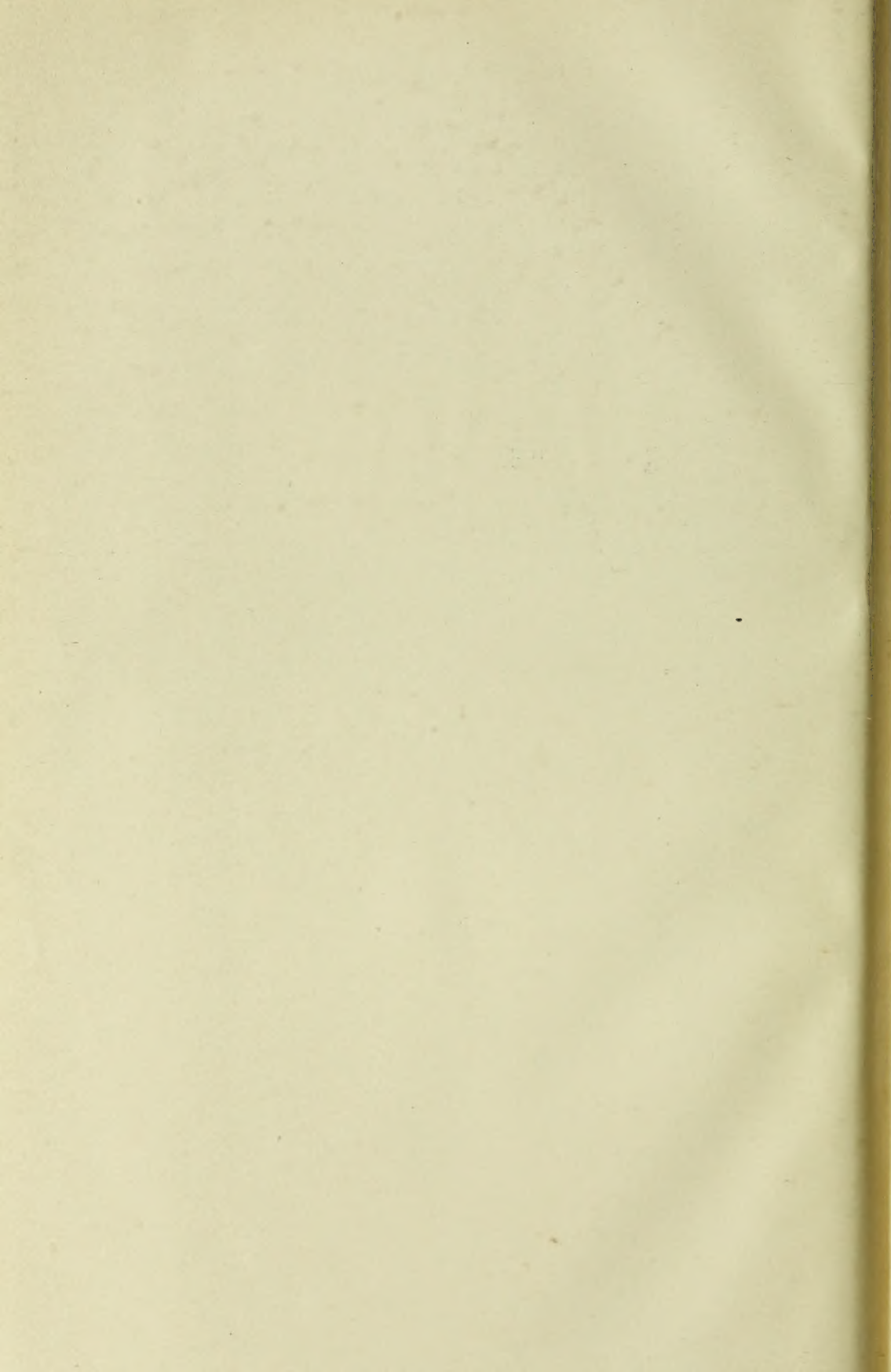
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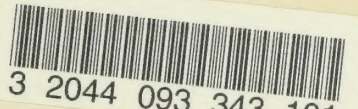












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